Post-graduate and Research Department Series No. 15

"Professor P. D. Gune Memorial Lectures"

[First Series]

THE SCIENCE OF RITUAL

FRITS STAAL

Bhandarkar Oriental Research Institute
POONA, India
1982

Frits Staal

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Printed at : The Bhandarkar Institute Press,
Poona 411004, India.

Published by : R. N. Dandekar, Honorary Secretary,
Bhandarkar Oriental Research Institute,
Poona 411004, India.

FOREWORD

On the occasion of the Diamond Jubilee of the Bhandarkar Oriental Research Institute, which was celebrated in June 1978, Acharya V. P. Limaye donated to the Institute a fairly substantial amount of money to enable it to found a Lectureship in memory of his revered teacher in the Fergusson College, Poona, Professor Dr. Pandurang Damodar Gune. Accordingly, the Institute has undertaken to organize, once every two years, a series of lectures on a subject relating to Vedic studies, to be called " Professor P. D. Gune Memorial Lectures ".

Professor Gune was born at Rahuri, District Ahmednagar, Maharashtra, on May 3, 1884. After a brilliant academic career, in the course of which he bagged most of the scholarships and prizes assigned for Sanskrit, Gune passed his M. A. examination with distinction in 1906. Soon thereafter, he joined the Deccan Education Society as a Life-Member and began to teach Sanskrit in the Society's Fergusson College. In 1910, he proceeded to Germany for higher studies and worked for nearly three years at the Leipzig University under the guidance of Professor Brugmann, specializing in comparative philology. He was awarded Ph. D. of that University in 1913. The seven years from 1913 to 1920 may be characterized as the years of distinguished achievement in Gune's life. In addition to his normal work in the Fergusson College, where he soon established a well-deserved reputation as a successful teacher, Gune took the initiative in founding the Bhandarkar Oriental Research Institute in 1917 and became one of its first secretaries. He was also largely instrumental in bringing into being the All-India Oriental Conference, the first session of which was held at Poona in 1919. In 1917, Gune delivered at the Bombay University the prestigious Wilson Philological Lectures which were subsequently published in a book-form under the title, *An Introduction to Comparative Philology*. He was an active contributor to the *Annals of the BORI*, the

Indian Antiquary, and the Marathi *Vividha-Jñāna-Vistāra*, among other journals. He was also commissioned to edit two Prakrit works – one for the Gaekwad's Oriental Series and the other for the Calcutta University. All this strenuous work began to tell on him and he was soon seized by tuberculosis. On November 25, 1922, he fell a victim to that vile disease, and a very promising career was thereby abruptly cut short.

Acharya Limaye was himself one of the brightest pupils of Professor Gune, and he deserves all encomium for having thought of commemorating his Guru in such a worthy manner.

The first series of the "Professor P. D. Gune Memorial Lectures" was delivered by Professor Frits Staal of the University of California, Berkeley, on July 12–14, 1981, on the "Science of Ritual", at the Centre of Advanced Study in Sanskrit, University of Poona, in conjunction with the International Seminar on Pāṇini organized by the Centre. The best thanks of the Bhandarkar Oriental Research Institute are due to Professor Staal for having accepted its invitation to deliver these lectures at a comparatively short notice. Professor Staal has made a special study of the Śrauta Ritual – both from the point of view of the texts and of the actual performance – as his forthcoming *AGNI – The Vedic Ritual of the Fire Altar* will amply testify. His expert knowledge of the subject will be seen to have been reflected also in these lectures.

Bhandarkar Oriental
Research Institute, Poona
March 10, 1982

R. N. Dandekar

PREFACE

Man is addicted to ritual activity, a fact that is true of modern society as much as it is true of ancient societies, and that applies to so-called primitive communities as much as it applies to the so-called civilized world. In this booklet I argue that we need a science of ritual if we wish to understand man in all his manifold activities. I also claim that such a science already existed in ancient India. The Indian science of ritual was a thoroughly rational discipline with a great respect for facts. Though the ritualists who developed this science believed in the efficacy of ritual, their belief did in no way affect or interfere with their scientific enterprise. I hope that the claim that it did exist may add substance to the argument that we need such a science. In passing I have criticized some existing approaches to the study of ritual which I regard as unscientific and unsatisfactory.

The only three disciplines that are nowadays interested in ritual are anthropology, psychology, and the study of religion. It might therefore be assumed that I am a practitioner of one of these three. However, I am not, as will readily be seen. I might be described as a philosopher who has long been exposed to India, and who in the course of this exposure has been caught in the webs of Sanskrit and Indology. The lectures upon which this booklet is based were addressed to Sanskritists, primarily Sanskrit grammarians. Such was an ideal audience, because Sanskrit grammarians are not only scholarly and knowledgeable, but critical and endowed with more independent judgement than most people think. Moreover, this audience was ideal in a more significant sense. The science that was closest to the ancient Indian science of ritual was grammar. The importance of Pāṇini's grammar has long been known to linguists, and it is no longer controversial to state (with a variation on Bloomfield) that Pāṇini's grammar is one of the greatest monuments of the

scientific genius of man. There is no single work in the Indian science of ritual that can claim so exalted a position. However, I hope to show in this book that the Śrauta Sūtras exhibit a similar scientific spirit and comparable qualities.

Among Sanskritists, specialists of Vedic ritual employ various, sometimes overlapping approaches: traditional, philological, historical, and anthropological, with admixtures from a variety of other disciplines. I hope that the approach displayed in the following chapters will appeal to them. I am confident that these chapters will be of some interest to Sanskrit grammarians and to Indologists generally. Moreover, I cannot help feeling that they should be useful to the three kinds of practitioner mentioned at the beginning of the previous paragraph. Ideally, I am addressing ritualists, but since I argue that we need but don't have them, it is only logical to conclude that I have not yet succeeded, at least in this respect.

The book consists of three chapters. In the first I touch upon science in general, and spend some time with the sister sciences of ritual and grammar that originated in ancient India. I address myself to historical as well as conceptual issues, e. g., how can there be a science of ritual if science and ritual are antipodes. In the second chapter I explore an example of applied ritual science. The results are historical reconstructions, pertaining to Vedic and pre-Vedic events. The third chapter analyzes a feature of Indian ritual involving geometrical structures that may be pre-Vedic, and that are approached in a spirit of ritual geometry. This chapter provides substance to the claim that the existing approaches to the study of ritual are inadequate.

The first chapter will be published separately in *the Journal of Indian Philosophy.* In the second and third chapters, data have been utilized from the 1975 performance of a large Vedic ritual, the Atirātra-Agnicayana, by Nambudiri brahmins of Kerala. This ritual performance is described and studied in greater detail in: *AGNI – The Vedic Ritual of the Fire Altar*, Vols. I–II (Berkeley, 1982).

The text that is presented here is a revised version of the three "Professor P. D. Gune Memorial Lectures," delivered at the University of Poona on July 12, 13, and 14, 1981, under the auspices of the Bhandarkar Oriental Research Institute. I am very grateful to Professor R. N. Dandekar for inviting me to deliver these lectures, and to the Bhandarkar Oriental Research Institute for publishing them in this form. The written text has benefitted substantially from other lectures, discussions, comments and remarks during the International Seminar on Pāṇini, when these lectures were delivered. I am indebted to the Smithsonian Institution for enabling me to participate in this Seminar. I am especially grateful for the comments made by Professor Paul Kiparsky at Poona, Professor Romila Thapar at New Delhi, Professor Yutaka Ojihara and Dr. Shingo Einoo at Kyoto.

My final thanks go to Gene Smith, in whose hospitable home this book was written. I had just returned from Poona, and was waiting to start on a long Himalayan trek. The gloom of the Delhi monsoon, the heat and humidity of the Indian summer, and the resulting intermittent collapse of transportation and communication combined to keep me at my desk. The results may be meagre in comparison to the vast extent of the subject; but they are offered to the reader with a ritual invocation attributed to Nāgārjuna:

བློ་གཞན་ཉིད་ཀྱིས་གང་དེ་མ་བསྟན་གང་ཞིག་བསྟན། །
ནད་རྣམས་རང་གིས་ཡང་དག་རྟོགས་ནས་ཇི་ལྟའི་ཚུལ། །
སྨན་རྣམས་རྗེས་སུ་བློ་གྲོས་ཆུང་བ་རྣམས་ལ་བྱས། །
བསྟན་བཅོས་སུ་ནི་ཅུང་ཟད་གདན་ཕབ་འབྲས་བུར་བྱས། ། *

budhvaitad anyad api yadvad anuktam atra
yuñjyāt svayaṃ samadhigamya yathānurūpam |

rogeṣu bheṣajam analpamatir vidadhyāc-
chāstraṃ hi kiṃcid upadeśalavaṃ karoti //*

New Delhi, September 1, 1981 FRITS STAAL

* " Having understood this and whatever else is left unsaid,
May he with intelligence put together what he has studied.
Let him dispense the medicine to other diseases by analogy,
For this treatise is only a fragment of the teaching."
(*Yogaśataka* 108, ed. Filliozat)

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LECTURE I

RITUAL, GRAMMAR AND THE ORIGINS OF SCIENCE IN INDIA

1. *Introduction*

To most Western scholars and Westerners generally, science is a characteristically Western achievement. Whether science is considered a panacea or a curse, it is the West that receives the praise or blame. Confirming the myth of " le miracle grec ", the origins of science have been sought and found in Greece. It has long been customary to claim that Greek science, especially geometry, in its abstract and pure forms, presents a basic contrast to the practical concerns of the ancient Egyptians, who had to partition lands along the Nile, but never obtained more general insights or searched knowledge for its own sake. True, both Egyptians and Greeks knew how to construct a right angle with the help of a triangle with sides of 3, 4 and 5 units' length; but while the Greeks derived this as a theorem, to the Egyptians it allegedly remained a mere carpenter's rule. In this miserable role, the Egyptians have been appointed as representatives of all non-Greek civilizations of this world.

Modern research on the history of science has shown that such a picture is neither adequate nor justified. Babylonian mathematics and astronomy, for example, have been proved to be subjects of considerable interest. It is true that modern science, as it developed in the West since the sixteenth century, far surpasses almost anything that came before. However, it neither follows from this that science originated only in the West, nor that its later achievements took place only there. That the early developments of science are not confined to Europe has been established beyond any doubt in numerous publications. Though Neugebauer's work on the Ancient Near East may be pronounced a

close second, this is nowhere put forward more impressively than in Joseph Needham's volumes on "Science and Civilisation of China," a series that is still in progress. Many volumes of this monumental work deal with the physical or "positive" sciences, though a fair amount of space is taken up by what we would regard as technology. For India, we do not possess any such standard work. There are numerous monographs in the field, from early attempts such as Brajendranath Seal's "The Positive Science of the Ancient Hindus" of 1915, to contemporary publications of the Department of Mathematics and Astronomy of the University of Lucknow, comprising a series of texts edited by Ram Ballabh, Kripa Shankar Shukla and others, which also continue to be in progress; as well as publications by the National Institute of Science, New Delhi.

In the present paper it is argued that the earliest Indian sciences were ritual and grammar. If this is a fact, it is a peculiar fact, because there are people who would not regard grammar as a science - not to mention anything as unscientific as ritual. In fact, these subjects are nowadays dealt with under the headings of either the humanities or the social sciences. Discussions on the possible status of such disciplines as a science seem to be never ending. It is obvious from my claims, that my concept of science is much more flexible than what some of the proponents of these debates must have at the backs of their minds. I shall, therefore, begin with a brief sketch of the concept of science, without aiming at anything as precise as a definition.

I regard the following four features as characteristics of science, and present, though in varying degrees, in the sciences I am familiar with:

(1) A science consists in part of a body of statements, rules, theorems, which aim at the true description and analysis of some part of the world. There must be a measure of empirical adequacy to these, which can be established, not necessarily for all of them, by tests, verifications, or falsifications, directly, indirectly, or at least in principle.

(2) Complementing and extending this empirical adequacy, there are abstract generalizations that go beyond the data, and may be hypothetical, postulated, or speculative. Such generalizations may include predictions, and be based upon anything (e. g., a scientist's intuitions or dreams).

(3) This entire edifice of descriptions and generalizations should be consistent to some extent; in particular, contradictory statements can never be regarded as final. However, in most cases it is not easy to ascertain whether two statements, even if fully explicit, are contradictory.

(4) There is a methodology of argument which addresses itself to different viewpoints and propositions, and proceeds to a shifting of options so as to reach a generally accepted conclusion. The generalizations mentioned under (2) are sometimes arrived at through such a process. Logical derivations within a theory may be regarded as formalized specimens of such argumentation.

These characteristics are fairly vague, not operational, and not free from redundancy. There may be sciences that are not in accordance with some of them (e. g., mathematics). However, these characteristics are sufficient for my present purpose. As a fifth one might add a feature that emphasizes the pure and theoretical nature of science. This feature was much admired by the Greek philosophers. Aristotle commented favourably upon the notion of θεωρια as "desinterested contemplation"! Since some of my colleagues who claim to be scientists also claim that they deal with what they deal with because it is ultimately useful or relevant, I shall not include this feature. When necessary, we may simply distinguish between "pure" and "applied" science.

2. *Ritual and Grammar in Ancient India*

The Indian disciplines of ritual and grammar, which I have come to regard as sciences, were in ancient India called *śāstra*. This term has been translated as "traditional discipline" or "traditional science." However, I would not regard everything that used to be called *śāstra* as "science." At an earlier period,

ritual and grammar were considered *vedāṅga*, or "(disciplines) auxiliary to the Vedas". There existed a certain complementarity between these two. In order to explain this, we need some conceptual and terminological clarification.

Grammar, Sanskrit: *vyākaraṇa*, is a discipline which has language for its object. In the work of Pāṇini, the greatest Indian grammarian, the object-language is to some extent *chandas*, "the metrical portions of the Vedas," viz., *mantras*; and to some extent *bhāṣā*, the spoken language of Pāṇini's time, which has been shown to be co-extensive with the domain of Vedic prose (primarily, the Brāhmaṇas, Āraṇyakas, early Upaniṣads, and Śrauta Sūtras).

Ritual is an ambiguous term. On the one hand it refers to a *discipline*, the "science of ritual", which is embodied, in the Vedic realm, in the Gṛhya and Śrauta Sūtras; and on the other hand it refers to the *object* of this discipline. The two chief types of ritual text correspond to the two chief types of object-ritual: the *gṛhya* or "domestic" ritual which comprises so-called life-cycle rites or sacraments (rites that accompany birth initiation, marriage, etc.); and the *śrauta* ritual, sometimes referred to as "solemn" ritual (from the French "rites solennels"), which is much more complex. I shall be exclusively concerned with the *śrauta* ritual, because it exhibits the general features of Vedic ritual more clearly and explicitly, and has also been better described in the texts. There are several general differences between the two kinds of ritual, that are purely formal: for example, one fire and one altar occur in the *gṛhya* ritual, as against three in the *śrauta* ritual; one priest, the *purohita* or "domestic priest", officiates in the former, and up to sixteen (four for each of the four Vedas) in the latter; moreover, only the latter type of ritual may involve animal sacrifice and libations of Soma.

The complementarity between ritual and grammar, to which I shall return, has a background that may be called metaphysical, and that should be briefly noted. From the Ṛgveda onward there has been a belief in India, that the most effective ritual

activity is that which is accompanied by language, in particular recited or chanted language; complementarily, the most effective language is that which is accompanied by ritual activity. Of course, such beliefs are more or less universal. Important events are still initiated with speeches, pomp, and ceremony. In the Ṛgveda, this attitude is expressed variously, for example in ṚV. 7.26.1 : " Some unpressed has never intoxicated Indra, nor the pressed juices unaccompanied by sacred hymns ".[1]

3. *Vedic Ritual : An Example*

Ritual has been defined in an often quoted text from Kātyāyana's Vājasaneyi Śrauta Sūtra as consisting of three elements : *dravya*, the substance of the oblation, e. g., barley, a goat, or Soma; *devatā*, the deity to whom the recitations and chants are addressed and the offerings made, e. g., Agni, Indra, or Prajāpati; and *tyāga*, the formula of renunciation pronounced by the patron of the ritual or *yajamāna* at the time the oblation is made, for example, with reference to Agni :

agnaya idaṃ na mama
" this is for Agni, not for me ! "

Kātyāyana's definition is not really adequate, and it does not convey the flavor of Vedic ritual to anyone who is not already familiar with it. To appreciate more adequately the nature of ritual, its relationship with language, and the questions to which it gives rise, a particular rite should be studied in greater detail. I have selected the *sāmidhenī* or " firewood verses ", recited when sticks of firewood (*samidh*) are placed on the fire. These verses are described or referred to in most of the Śrauta Sūtras, and are also dealt with by the early grammarians (e. g., Pāṇini 3.1.129; Cf. Navathe 1979). The *sāmidhenī* rites are most easily understood when we formulate some of the questions to which they give rise, and which are dealt with exhaustively in the relevant passages of the Śrauta Sūtras.

1. Quoted after Brough 1971, 338–339, in Staal 1975, 183.

(1) The first question regarding these verses is *when* they are recited. They are obviously recited *after* the fire has been installed, and accordingly *after* the altar, on which the fire is installed, has been constructed and consecrated; but also *before* any of the oblations or libations into the fire are made. In practical terms, and depending on the length of a particular ritual, they take place in the early hours of days of a ritual performance.

(2) The next question is : *where* ?—The verses are recited to the west of the fire on which the firewood sticks are placed.

(3) *By whom* ?—The verses are recited by the Hotā, chief priest of the Ṛgveda, while the Adhvaryu, chief priest of the Yajurveda, puts the firewood sticks on the fire. The recitations of the Hotā are in principle described in his ritual manual, one of the Śrauta Sūtras attached to the Ṛgveda; and the rites of the Adhvaryu are similarly described in the Śrauta Sūtras attached to Yajurveda. However, as the ritual is primarily based upon and centered in the Yajurveda, the Śrauta Sūtras of the Yajurveda are more comprehensive than any of the others.

(4) What are the *positions* of the priests ?—The Hotā sits cross-legged with hands folded and facing east. The Adhvaryu stands to the north west of the altar.

(5) *How many* verses and sticks are there ?—In the simplest form or paradigm of rite, as we find it in the *iṣṭi* prototype of the *darśapūrṇamāsa* or " Full and New Moon Rituals ", there are eleven verses, all from the Ṛgveda. Since the first and the last are recited thrice, the number becomes 15. In other rites, the number is increased, for example to 13; since the first and last continue to be recited thrice, their number becomes 17. The number of firewood sticks need not be the same. In principle, the Adhvaryu puts one stick on the fire when the Hotā recites one verse. But he may also put several sticks on the fire at the same time, or merely make a waving movement over the fire when a particular verse is being recited.

(6) *How* are the verses recited ?—This matter is complex, and will only be dealt with in approximate terms. Each verse

consists of three portions, called *pāda* or "foot". The priest does not breathe at the end of a verse, but after the second *pāda*. At the end of the verse, he substitutes for the final syllable after its initial consonant a lengthened "o", which is connected with the beginning of the next verse. Only at this time can the Adhvaryu put a fire stick on the fire. The *sāmidhenī* verses are moreover recited *ekaśruti*, in monotone; and they are recited at medium pace and at medium volume.

These various details may be reconstructed from the Śrauta Sūtras, and also from the few surviving traditional performances of rituals in which they occur. However, the Śrauta Sūtras are no teaching manuals; they can only be understood by someone who is already familiar with the ritual. It took the genius of a Caland to reconstruct the ritual proceedings from such texts. This is one of the reasons that actual performances are so valuable for their understanding.

The ritual leaves ample scope for generalizations, and these are in fact made in the Śrauta Sūtras. The reason is that many ritual features are not confined to particular rites. The position of the Hotā, for example, when reciting the *sāmidhenī* verses-sitting cross-legged, facing east and with folded hands - is the same as at the *śastra* recitations of the Ṛgveda which characterize the Soma rituals (in the Agniṣṭoma there are 12 such recitations, in the Ukthya 15, in the Ṣoḍaśi 16, etc.)[2] The mode of recitation, with breathing and o-insertion, is also the same. However, the reciters are not the same, though the Hotā is among them; the location is not the same, for the priests sit to the west of their *dhiṣṇya* hearths in the Sadas. Pitch, volume, and pace are the same only during the five *śastras* of the midday pressing. At the morning pressing they are recited at a lower pitch and more slowly; and at the third pressing they are recited at a higher pitch and more quickly.

2. See Staal 1982, Volume I, which presents the *śastras* of the Atirātra-Agnicayana which include all these others.

Another important ritual feature illustrated by the *sāmidhenī* rite is the co-operation between different priests. It is not necessary, as we have seen, that the number of verses and firesticks is the same; but the correlation is specified, so that it is clear what the Adhvaryu does at each recited verse. This has important implications. Since Ṛgveda rites are recorded in Ṛgveda Śrauta Sūtras, Yajurveda rites in Yajurveda Sūtras, and since there are several different Śrauta Sūtras for each of the Vedas, effective co-operation between the priests is only possible when particular Śrauta Sūtras are properly coordinated. The Nambudiri *śrauta* performances in Kerala are in fact possible because the priests belong to Baudhāyana (for the Yajurveda); Śāṅkhāyana (for the Ṛgveda), and Jaiminīya (for the Sāmaveda). The Śrauta Sūtras attached to these three schools are attuned to each other. In other parts of India, *śrauta* rituals have been performed with Sāmaveda priests imported from elsewhere. In such cases, perfect coordination is not always attained.

4. *Sanskrit Grammar: An Example*

Grammar and language are more familiar to contemporary readers than ritual facts and theories; even so, an example from Sanskrit Grammar may not be altogether superfluous. The following illustration has been taken from Kiparsky's analysis of some syntactic methods used by Pāṇini in his grammar, the Aṣṭādhyāyī or "Eight Chapters".[3] The example is a simplified and abbreviated derivation of the Sanskrit sentence: *devadattaḥ pacaty odanam*, "Devadatta is cooking rice."

The derivation begins by selecting items from the lexicon and deciding upon a semantic relation between them. To the nominal items are assigned gender, number, and person, and to the verbal items, a time reference. The nominal items *devadatta*,

3. Quoted from an unpublished manuscript entitled "Case, Control, and Ellipsis in Pāṇini's Grammar", which constitutes the text of the first Professor K. V. Abhyankar Memorial Lecture, delivered by Professor Kiparsky during the International Seminar on Pāṇini already referred to. These lectures will also be published separately. Cf. also Kiparsky and Staal 1969.

treated semantically as "independent," and *odana*, "rice," semantically characterized as "goal," are each given masculine gender, singular number, and no person (viz., neither "first," nor "second" person). For the verbal root *pac*, "cook," we choose reference to ongoing time, and verbal endings that semantically express "agent."

The necessary endings will now be specified by various grammatical rules, all expressed in sūtra form in Pāṇini's grammar. The cases are determined by semantic principles similarly provided by the grammar. For example, "goal" may be expressed by verbal endings or by the Accusative nominal ending. Similarly, "agent" may be expressed by verbal endings or by the Instrumental nominal ending. An important syntactical principle has to be taken into account, expressed in the grammar by sūtra 2. 3. 1 : *anabhihite*, "if not (already) expressed". This specifies that each semantic relationship is expressed only once. In the present derivation, the verb endings have been chosen to express "agent". The "goal" is therefore not expressed by the verb, and so it gets the Accusative ending: *odāna* + *am* → *odanam*. But "agent" is already expressed by the verb, and so the Instrumental ending cannot be assigned, following the *anabhihite* principle. Therefore we are not in a position to apply: *devadatta* + *ena* → *devadattena*, and derive the incorrect sentence: **devadattena pacaty odanam.* Another sūtra (2. 3. 46) applies which states that the Nominative is used when only the nominal stem notion itself, gender, number, and case remain to be expressed. Thus the correct form: *devadattaḥ pacaty odanam* is correctly derived.

Since the facts of the language, in this case, are relatively simple, and we are dealing with only one text, Pāṇini's grammar, it has been possible to make precise references to some of the sūtras. In our ritual example this would only have been possible by referring to various texts, and by explicating their organization and method of exposition more fully. Some of these latter topics will be taken up later.

It is clear that in grammar, as in ritual, there is ample scope for generalization. Most of the rules referred to are already generalizations, for they apply to other examples as well. Not only are the same endings attached to different lexical items, but the same syntactical principles are valid throughout the language. The rules of grammar themselves have also general properties, to which we shall return.

5. *Origins and Relative Chronology*

Before proceeding to a further conceptual analysis and comparison of ritual and grammatical theories, and before discussing the scientific character of these theories, we should direct attention to some problems of origin and relative chronology. After all, we are not dealing with abstract concepts only, but with specific traditions, schools, and that, they have been in a position to influence each other.

References to ritual occur in the Vedas from the earliest strata, but they are especially abundant in the Yajurveda, the Veda of ritual "par excellence." The Śrauta Sūtras of the Black Yajurveda are accordingly the oldest, and the earliest among them are similar in style to the Brāhmaṇas of that Veda. For grammar we can also trace a Vedic background, for a concern with language is also widespread in these texts. The term *akṣara*, "imperishable", for example, occurs in the Ṛgveda in the meaning "language" and is closely related to *vāc* and *brahman* (*akṣarā*, incidentally, may mean "cow"). The earliest references are mystical, e. g. RV 6. 16.35-36 which is addressed to Agni:[4]

> *gárbhe mātúḥ pitúṣpitā́ vidídyutānó akṣáre |*
> *sī́dann ṛtásya yónim ā́ ||*
> *bráhma prajā́vad ā́ bhara jā́tavedo vícarṣaṇe |*
> *ágne yád dīdā́yat diví ||*

"Sparkling in the *akṣara*, your mother's womb, as your father's father, seated in the womb of cosmic order –

4. Quoted in van Buitenen 1959, 178b.

Splendid Agni, Jātavedas, deliver *brāhman,* rich in offspring, which radiates in heaven."

From the Yajurveda onwards, *akṣara* means "syllable", used not only to refer to mystic syllables such as OM, but also for counting syllables (*dvyakṣara, tryakṣara,* etc.), important for determining meters and metrical structures which were of great concern to the Vedic poets.

The real precursor of grammar in the realm of the Veda is the Padapāṭha, the word-for-word analysis of the continuous (*saṃhita*) text of each of the Vedic Saṃhitās (called after this), which must have been composed not long after these (the Ṛkpadapāṭha around 1,000 B. C., at a semi-educated guess). The Padapāṭha is clearly presupposed by Pāṇini. V. N. Jha has shown in a series of articles[5] that the notion of *pada,* "word", as it occurs in the Ṛkpadapāṭha is used not only of words, but also of nominl stems, or "internal" words, as he calls them. One reason is that in Sanskrit, the euphonic rules of *sandhi* apply not only *between* words that are in juxtaposition, but also, at least to a large extent, *within* words between the nominal stem and inflexional or derivational suffixes. However, the analysis of the Padapāṭha is often inconsistent and haphazard. For example, the case endings *-bhiḥ, -bhyām, -bhyaḥ,* and sometimes *-su,* but none of the others are separated from the stem. Pāṇini and other early grammarians improved upon this analysis, and went also beyond the analysis of words.[6]

The Brāhmaṇas of the Vedic period are concerned with ritual, but in a speculative and often contradictory manner. They offer interpretations of rituals and rites, but it is clear that they are often at a loss what meanings to assign. The same rites are often provided with a great variety of mutually contradictory

5. Including Jha 1973, 1975a, 1975b, and 1976.

6. This shows, incidentally, that the Padapāṭha had already reached a level of linguistic sophistication comparable to A. Reichling's book "Het Woord" of 1935, which was influential in European linguistics until generative grammar demonstrated the importance of syntax.

interpretations. The Śrauta Sūtras, which belong to the same period, describe each ritual in precise detail, without referring to meaning or matters of interpretation at all. As Tsuji (1952) has shown, the Brāhmaṇas and Śrauta Sūtras are, within each Vedic school, closely related: the Brāhmaṇas presuppose the ritual which their Śrauta Sūtras describe. The earliest Śrauta Sūtra is that of Baudhāyana, which belongs to the Taittirīya *śākhā* (" branch ") of the Black Yajurveda. Closely related to it is the Vādhūla Śrauta Sūtra, available in manuscript but only partially published. Both are in several respects similar to their Brāhmaṇa, the Taittirīya. The Baudhāyana Śrauta Sūtra seems to be the first full-fledged sūtra text in India's intellectual history.[7] Sūtras are noted for several features, among which explicitness, unambiguity, and conciseness are the most characteristic. The sūtras of the Baudhāyana Śrauta Sūtra are already fully explicit and unambiguous, but they are less concise than most of the later sūtras. They also incorporate stories such as are frequently found in the Brāhmaṇas, but rarely in the later sūtras. Gonda has recently translated one of these stories, which deals with the so-called *naiṣṭyayana* oblations:

> " A brahmin who was desirous of Soma met on his way with a white, red-eyed person whose head was broken and who was dripping with blood. He said to him: ' How could I come to know you, venerable man ? ' He answered: ' I am king Soma. A wretched Adhvaryu who did not know the *naiṣṭyayanas* has pressed me out. When a wretched Adhvaryu who does not know the *naiṣṭyayanas* presses me out I shall certainly drip blood. A certain brahmin, So-and-so by name, is acquainted with the *naiṣṭyayanas*. I shall go to him. He will restore the normal colour to my face ".
>
> (Gonda 1977, 641).

The Śrauta Sūtra of Baudhāyana was called *pravacana*, a controversial term which probably denotes " oral teaching ".

7. Louis Renou has analyzed the development of the *sūtra* style in an important study ; Renou 1963.

According to Caland, who was the first to draw attention to its significance and archaic style, and who edited the text in the *Bibliotheca Indica*, it should be assigned to approximately 800 B. C. Whether or not this date is accurate, the Baudhāyana Śrauta Sūtra is certainly very early, and the first example of this kind of work.

An early Śrauta Sūtra of the Ṛgveda is the Śāṅkhāyana, Kashikar (1968, 150) has convincingly argued that a rule of Pāṇini which deals with the ritual exclamation *vauṣaṭ*! is derived from this text. Kashikar reasons that Pāṇini 1. 2. 35: *uccaistarāṃ vā vaṣaṭkāraḥ* "optionally *vauṣaṭ* should be shouted at a higher pitch" presupposes Śāṅkhāyana Śrauta Sūtra 1. 1. 34: *uccaistarāṃ vaṣaṭkāraḥ* 1. 1. 35 *samo vā* "*vauṣaṭ* should be shouted at a higher pitch (than the preceding *yājyā*), or at the same pitch." It may be noted in this connection that Kiparsky's recent book, "Pāṇini as a Variationist" (1979) further supports this chronological relationship. According to Kiparsky, *vā* in Pāṇini refers to preferred options. In contemporary ritual practice, all over India, the second syllable of *vauṣaṭ* is in fact shouted at a higher pitch and at the top of one's voice. It is reasonable to suppose *either* that this practice prevailed at Śāṅkhāyana's time, but that he did not yet use *vā* to denote preferred option; *or* that he did already use *vā* in that sense, but that the practice of shouting *vauṣaṭ* loud had not yet become widespread. In either case the analysis only makes sense if Śāṅkhāyana is earlier than Pāṇini.

The early date of Baudhāyana and Śāṅkhāyana is also reflected by the fact that both sometimes quote entire mantras, instead of quoting them by their initial words or syllables (*pratīkena*), the common method in all later sūtras. A third Śrauta Sūtra that must be equally early is the Jaiminīya attached to the Sāmaveda. Though Kashikar in his survey has not included it among the earliest sūtras it is rightly placed there by Mylius in his review of Kashikar's book (1970, 334), and by Gonda and Parpola in other publications. It is significant that the triplet Baudhāyana (Yajurveda), Śāṅkhāyana (Ṛgveda), and Jaiminīya

(Sāmaveda) are compatible with, and attuned to each other in the sense referred to earlier, as further corroborated by their fruitful cooperation in the Nambudiri śrauta tradition of Kerala, which is in many respects extremely archaic (see Staal 1982, *passim*). It is noteworthy that the only extant manuscripts of the Vādhula Śrauta Sūtra also come from Kerala.

The four Śrauta Sūtras I have mentioned are certainly all earlier than Pāṇini. The relative chronology of later Sūtras, such as Āpastamba, and their relation to Pāṇini, is uncertain. Kashikar placed Āpastamba rather early, but his reasons are not compelling, as we shall see. The claim of Navathe (1972), that Pāṇini borrowed from the Mānava Śrauta Sūtra, is not substantiated either, as far as I can see, in spite of the interesting parallels he has discussed. Similar claims made on behalf of Āśvalāyana are also unsupported. We shall return to another assumption which underlies these statements of relative chronology, namely, that the texts constitute single units. This may affect the significance of some of our conclusions, as does the fact that many of these texts quote predecessors. Pāṇini, for example, mentions ten earlier grammarians or grammatical schools, and the Dvaidha section of Baudhāyana mentions, on Kashikar's count, not less than nineteen such predecessors.

We have seen that the Padapāṭha is definitely earlier than Pāṇini. We shall now have to pay attention to a class of works that deal with these recitations: the Prātiśākhyas, " one for each school (of the Veda) ", phonological treatises that are chiefly concerned with two tasks : to provide rules for deriving, *from* the Padapāṭha, (1) the Saṃhitā (pāṭha) and (2) the Kramapāṭha. Kramapāṭha denotes a mode of recitation, composed probably for mnemotechnic reasons, in which each word of the Padapāṭha is recited twice, but in such a manner, that it is first linked (through *sandhi*) with the preceding *pada*, and next with the following *pada*. In other words, if the words of the Saṁhitā are denoted by numerals, the three modes of recitation may be defined as follows :

SAMHITĀPĀTHA : 1 2 3 4 5 ...

PADAPĀTHA : / 1 / 2 / 3 / 4 / 5 / ...

KRAMAPĀTHA : / 12 / 2 / 3 3 / 4 / 4 / 5 / ...

where a *daṇḍa* " / " denotes a juncture where *sandhi* does not apply and the reciter may pause to breathe.

One characteristic of the Prātiśākhyas, that there is one for each of the Vedic schools, conforms to the structure of the Śrauta Sūtras, but not to Pāṇini, whose grammar applies "to all the Vedas" (as Patañjali says in the introduction to his commentary). There has been a consensus among scholars to assign the Ṛkprātiśākhya and the Taittirīya Prātiśākhya to an earlier date than Pāṇini. Thieme, on the other hand, has shown that the Vājasaneyi Prātiśākhya of Kātyāyana is so close to the *vārttikas* or rules of interpretation on Pāṇini's grammar composed by the grammarian Kātyāyana, that there is reason to believe that both Kātyāyanas were the same (Thieme 1935a and 1937–38). It can in fact be shown that the Vājasaneyi Prātiśākhya is more sophisticated, in some respects, than the Ṛk– and Taittirīya Prātiśākhyas. Confining ourselves to matters of order, for example, it may be noted that the latter two Prātiśākhyas regard only word order (viz., the order of the *padas* of the Padapātha), whereas the former also takes rule order into account. Some examples may illustrate this.

Taittirīya Saṃhitā 3. 2. 5. 1 has the form : *bhakṣehi*, which the Padapātha analyzes as : *bhakṣa / ā / ihi*. The Taittirīya Prātiśākhya contains three rules that may be applicable here, and that are similar to the following *sandhi* rules :

$$a + \bar{a} \rightarrow \bar{a} \quad (1)$$

$$\bar{a} + i \rightarrow e \quad (2)$$

$$a + e \rightarrow ai \quad (3).$$

The question arises how these rules have to be applied. There are two alternatives. If the juncture between the first two *padas* is considered first, onlp (1) can apply, yielding : *bhakṣā*. Next (2) applies to : *bhakṣā* + *ihi*, yielding the form of the Saṃhitā :

bhakṣehi. If on the other hand the juncture between the last two *padas* is considered first, application of (2) gives : *ehi.* Next (3) applies to : *bhakṣa* + *ehi*, producing the form : *bhakṣaihi*, which differs from what occurs in the Saṃhitā. The second alternative therefore has to be excluded. This is effected by a metarule, Taittirīya Prātiśākhya 5. 3 : *tatra pūrvaṃ pūrvaṃ prathamam*, " there what is earlier should be taken first ".

Note that this metarule does not take account of the order in which rules have to be applied, but only of the order of the *padas* to which rules apply. Note also that rules such as (1) – (3) are *ad hoc* and not general in at least two respects. First, and most significantly, the rules are only designed to relate Saṃhitā and Padapāṭha to each other; they are not applicable to Sanskrit in general – a fact to which I shall revert. Second, there are obvious generalizations that cannot be stated when the vowels are referred to in the manner in which they occur in (1) – (3). Different Prātiśākhyas deal with these problems in different ways, but only Pāṇini solved them by introducing a special device, implicit in his metarule 1. 1. 70 : *taparas tatkālasya.* According to this metarule, any vowel followed by the metalinguistic marker -*t*, denotes only the vowel of its own length, e. g. : " *at* " denotes (short) *a*, " *īt* " denotes (long) *ī*. etc. Accordingly, an *unmarked* vowel such as " *a* " denotes both short *a* and long *ā*. Now it becomes easy to formulate a general *sandhi* rule as : *a* + *i* → *e* and include all combinations of short and long vowels (cf. Staal 1965).

The Vājasaneyi Prātiśākhya deals with a more complicated problem. In forms such as : *mahāy indra*, the *y* is elided according to a rule (4. 124), yielding : *mahā indra.* However, at this point, another rule : *ā* + *i* → *e* (4. 51) does *not* apply, for it would produce incorrectly : *mahendra.* Now rule order is taken into account. The rules are ordered in such a way, that 4. 51 precedes 4. 124, so that the following metarule (Vājasaneyi Prātiśākhya 3. 5) applies : *na parakālaḥ pūrvakāle punaḥ* " (what was applied) at a former time is not at a later time again (applied) ".

Before comparing these order relationships with the order relations in Pāṇini's grammar, it must be emphasized that the Prātiśākhya literature, as distinct from the works of the Sanskrit grammarians, is empiricist in a specifically narrow sense. These works do not study the Sanskrit (or Vedic) language in general, but only a specific finite corpus of language : the Vedic corpus, as preserved in the Saṃhitā and Padapāṭha forms of recitation. This corpus-oriented empiricism is similar in outlook to the attitude of Whitney, who accordingly misunderstood the Sanskrit grammarians who are in this respect closer to contemporary linguists (cf. Staal 1972, 138–41). For this reason, the apparent *sandhi* rules of Prātiśākhyas are not really *sandhi* rules. This is obvious when we are dealing with a situation where there is an irregularity, from our point of view. This is not treated differently from what we would regard as regularities, because those are not considered regularities at all.

An example is Ṛgveda 5. 2. 7, of which the three traditional recitations are the following (cf. Staal 1967, 22–23) :

SAṂHITĀPĀṬHA : *śunaścicchepaṃ niditaṃ sahasrād yūpād amuñcaḥ*

PADAPĀṬHA : *śunaḥśepam / cit / ni-ditam / sahasrāt / yūpāt / amuñcaḥ //*

KRAMAPĀṬHA : *śunaścicchepaṃ niditam / niditaṃ sahasrāt / sahasrād yūpāt / yūpad amuñcaḥ //*

Ṛkprātiśākhya 11. 13 addresses this curious tangle with the help of the following rule : *anānupūrvye padasandhyadarśanāt padavyavetaṃ ca padaṃ vyavāyi ca* (*atiyante*, from 11. 3) "since the *sandhi* of the words (of the Saṃhitāpāṭha) is not shown when the word order is not in accordance (with the Padapāṭha), the divided word and the dividing word are passed over (in the Kramapāṭha)."

This rule applies to several other cases, but that is only because the Kramapāṭha has been constructed accordingly. It is in fact entirely *ad hoc*, and does not formulate any general property of any language. Other rules that apparently formulate general

properties are equally *ad hoc*. This may seem to suggest that the Prātiśākhya literature is earlier than Pāṇini, but we know that this is not the case with regard to the Vājasaneyi Prātiśākhya. It might be better to conclude that the *attitude* exhibited by the Prātiśākhya literature goes back to a period that is earlier than Pāṇini. Since the Vedas had to be preserved, it is quite possible that Prātiśākhyas contemporary with or even later than Pāṇini preserved this attitude. It would not be difficult to find parallels to such a situation in contemporary linguistics.

Problems of rule order play a very important role in Pāṇini's grammar (see, e. g., Buiskool 1939; Joshi and Kiparsky 1979). The Prātiśākhya literature seems quite clumsy by comparison, in this respect. If we wish to make a distinction between pre-Pāṇinian and post-Paṇinian Prātiśākhyas, we would have to introduce a measure by which we can distinguish between pre-Pāṇinian and post-Pāṇinian clumsiness. As a matter of fact, it is not obvious that the Ṛk- and Taittirīya Prātiśākhyas predate Pāṇini. Kiparsky has shown[8] that the accentuation of the Ṛgveda reflects Pāṇini's rules of accentuation, while the accent rules found in the Ṛk- and Taitttirīya Prātiśākhya represent a later stage of development. Moreover, the view of B. K. Ghosh (1934), that Pāṇini was influenced by the Ṛk-prātiśākhya, has been refuted by V. N. Jha (1973). Lastly, that there must have been a considerable gap between the various Padapāṭhas and all the Prātiśākhyas is shown by the following general considerations. Originally, the Padapāṭha was obviously derived from the Saṁhitāpāṭha. It constitutes in fact the most natural analysis that anyone would apply to a language that is or is beginning to be a little unfamiliar: a decomposition of the flow of speech (*saṁhitā*) into its constituent words (*pada*). In the literature of the Prātiśākhyas, however, it is the Padapāṭha that is regarded as basic (*prakṛti*). This is a truism with respect to the Kramapāṭha, but a mystery with respect to the Saṁhitāpāṭha. The Aitareya

8. In his second Professor K. V. Abhyankar Memorial Lecture entitled "The Vedic and Pāṇinian Accent Systems", also read during the International Seminar on Pāṇini.

Āraṇyaka pays attention to this puzzle by referring to the mysterious force of *sandhi*, which enables us to derive from the man-made (*pauruṣeya*) Padapāṭha the Saṁhitā which is of non-human (*apauruṣeya*) origin and therefore transcendent. To us, who adopt a historical perspective, it must be obvious that it has taken time to reverse the roles of Saṁhitā and Padapāṭha.

Summing up, I believe that at the present stage of our knowledge, the following table depicts relationships of relative chronology that may be taken as established. In this table, the three sections that are divided by horizonal lines represent three distinct periods. The chronological relations within each section, however, remain wholly uncertain.

ŚRAUTASŪTRA	PRĀTIŚĀKHYA	VYĀKARAṆA
Baudhāyana-Vādhūla Śāṅkhāyana Jaiminīya	PADAPĀṬHA	
Āpastamba	Ṛk-Prātiśākhya Taittirīya Prāt.	Pāṇini
	Vājasaneyi Prāt. of Kātyāyana	Vārttikās of Kātyāyana

6. *Abstraction and Generalization*

We have seen from our examples that ritual and grammar both leave ample scope for generalizations. The sūtra style, initiated by Baudhāyana and culminating in Pāṇini,[9] is eminently suitable to express such generalizations. It leads to an artificial and formal system that is only intelligible to specialists. More ab-

9. Cf. Renou 1963, 180 : " Quant au *Baudhāyana* – qu'on s'accorde à reconnaître comme la plus ancienne école ' à sūtras ' du *Yajurveda* (on pourrait dire : de toutes les traditions védiques).."; and 1963, 198 : " Ce sont les sūtras de Pāṇini .. qui poussent au maximum le formalisme; " also : " l' apogée du genre."

stract generalizations are expressed by special types of sūtras, the so-called *paribhāṣā*-rules or "metarules" we have already met. These rules govern the application and interpretation of ordinary sūtra rules, and express the structure of the rule system itself.

The earliest *paribhāṣā* rules occur in a special section put at the end of the Śrauta-sūtra of Baudhāyana and called *karmānta*. Caland translated most of these into German in his first report on Baudhāyana. Gonda has recently translated and summarized the beginning of this section (Gonda 1977, 509–510). According to Gonda, this section illustrates the original meaning of *paribhāṣā* as a "discourse round the text". The following excerpts are based upon Gonda's renderings :

> " One should understand the ritual procedure from a group of five, viz. from the metrical texts of the Veda (*chandas*, i. e. the *mantra* portions of the Taittirīya Saṁhitā), the *brāhmaṇa*, conviction or certainty as a ground or means of action, by means of the method (*nyāya*), and by the means of the structure (*saṃsthā*). When we say ' From the metrical texts of the Veda ' that means that one should, in accordance with the order of the *mantras* observed in the tradition, conclude : ' this act must be performed first, this later '. Moreover, the very *mantra* announces the ritual act, and explains the act.... What one cannot execute by means of the metrical texts one should try to execute by means of the *brāhmaṇa*, for the *brāhmaṇa* prescribes with authority the purport of the undefined *mantras*, viz. ' he performs this act with this *mantra*, that with that '. For example, if the text mentions the *mantra* ' For refreshment (food) thee, for strength thee ' (TS. 1. 1. 1 a) he cuts off a certain branch.... Moreover, a *bhāhmaṇa* prescribes also the purport of acts that are not accompanied by *mantras*, when for instance it reads : ' At a distance of eight steps a brahmin should establish the sacred fire ..." (TB. 1. 1. 4. 1).... As to the expression ' by means of structure ', when the Soma has been stolen one should extract juice from *ādāra* or *phālguna* plants."

The last phrase seems to refer to substitutions, which are always justified provided the structure of the ritual is retained. Gonda continues with paraphrases of the text :

> Section 2 deals with some fundamental concepts relating to *mantras*, sacrificial rites etc. which are different in practice and applicability (*adhikaraṇa*)....In Section 3 an explanation is offered of the distinction between the 'warp' (*tantra*) and the 'woof' (*āvāpa*) of a sacrificial rite, that is of the framework, standing model, or those components which it has in common with other rites, and those that vary from ritual to ritual and are therefore the special characteristic features. In Section 4 the author deals with certain basic forms...defines and explains terminology, etc.... The seven Soma rituals are enumerated...Section 5 answers the question of the difference between the two terms used in the Baudhāyana corpus *pūrvā tatiḥ* and *uttarā tatiḥ* "the antecedent and the subsequent series of ceremonies." The standard ritual is *pūrvā tatiḥ*, and what one arranges (modifies) is *uttarā tatiḥ*; e. g., the establishment of the ritual fires is *pūrvā tatiḥ*, the re-establishment *uttarā tatiḥ*; of the vegetarian sacrifices (*iṣṭi*), the full and new moon sacrifices are the *pūrvā tatiḥ*, all the optional rites *uttarā tatiḥ*.... In Section 6, the author turns to the use of *mantras*, for instance : "One should not, for the sake of a ritual act, interrupt a *mantra*." In case of the immolation of a victim the *mantra* that is handed down is short, the act long, in other cases however the act is short but the *mantra* long....

Kashikar has used the position of the *paribhāṣā* section in each Śrauta Sūtra as a criterium for determining their relative chronology. However, this criterium is not dependable. The *paribhāṣās* of Baudhāyana are placed at the end of the work but they are rather verbose, archaic, and long. Most later *paribhāṣās* are succinct and *sūtra*-like in all respects. The *paribhāṣās* of Āpastamba are very brief and efficiently formulated, as we shall see, though they are placed at the end of their Śrauta Sūtra. Pāṇini's *paribhāṣās* deal with methods and abbreviations concern-

ing substitutions, contexts, and numerous more specifically linguistic notions that are employed throughout the grammar. Among logical *paribhāṣās* we have the famous : *vipratiṣedhe paraṃ kāryam* (1. 4. 2) " in case of contradiction (between two rules) the latter should be applied." This principle would safeguard the consistency of the system, but it is in fact only applicable in certain parts of the grammar. Many *paribhāṣā* principles are implicit in Pāṇini's grammar and were explicitly formulated only by later grammarians. Among them occurs the logical principle, adopted in most Indian *śāstras,* that the exception is stronger than the general rule : *utsargād apavādo balīyān.* More specifically linguistic is the distinction between *siddha* and *asiddha* which is basic to Pāṇini's grammatical system. Joshi and Kiparsky (1979, 224–225) formulate the traditional explication as follows : " Rule A is (*a*) *siddha* with respect to rule B " means " rule A is to be regarded as (not) having taken effect when rule B is to take effect " (see also Staal 1972, 207–208, with simple examples). Kātyāyana introduced the concepts of *antaraṅga* and *bahiraṅga,* which apply to internal and external constituents. For example, a rule applicable *within* a word is *antaranga* with respect to a rule which applies across word boundaries. The general principle which governs these concepts is expressed by a *paribhāṣā,* according to which *bahiranga* rules are *asiddha* with respect to *antaranga* rules.

The later grammarians also formulated less abstract and more colorful metarules. We have the well-known *paribhāṣā* which states that grammarians rejoice over the saving of half a mora (in formulating a grammatical sūtra) as much as over the birth of a son (*ardhamātrālāghavena putrosavaṃ manyante vaiyākaraṇāḥ*). Another metarule states : *parjanyaval lakṣaṇapravṛttiḥ* " the rules of grammar apply like rain ", viz., they are applicable to all forms of the language (provided, of course, the conditions for their applicability are met).

The later grammarians also introduced *ad hoc paribhāṣās* to deal with particular problems. Any contradiction or omission in Pāṇini's grammar was interpreted as a *jñāpaka,* an indication

that something else was intended. This is itself a clear indication that the grammatical schools had become dogmatic. This scholastic device led to metarules called *jñāpakasiddhaparibhāṣā* "metarules established by a *jñāpaka*". Such rules are *anitya*, not universally applicable. All the other *paribhāṣās* we have so far encountered are called *nyāyasiddhaparibhāṣā* "metarules established by a general principle." These are *nitya*, "universally applicable or general". The metarules of the Śrauta Sūtras are all *nyāyasiddhaparibhāṣās*, and therefore *nitya*. Śāṅkhāyana Śrauta Sūtra 1. 1. 29 formulates this by means of a meta-metarule stating that the *paribhāṣās* apply "to all rituals".

The Śrauta Sūtra of Āpastamba provides metarules in its final sections. They were translated by Caland into German as part of his complete translation of the sūtra. These metarules are succinctly expressed in simple Sanskrit, and deserve to be quoted if only because they constitute a perfect introduction to the study of Vedic ritual. Here are the beginning sūtras of these sections :

Āpastamba Śrauta Sūtra 24. 1. 1–26.

1. *yajñaṃ vyākhyāsyāmaḥ* "We shall explain the ritual"
2. *sa trayāṇāṃ varṇānāṃ brāhmaṇarājanyayor vaiśyasya ca* "it pertains to the three classes, brāhmaṇa, kṣatriya, as well as vaiśya"
3. *sa tribhir vedair vidhīyate* "it is enjoined (prescribed) with the three Vedas"
4. *ṛgvedayajurvedasāmavedaiḥ* "with the help of Ṛgveda, Yajurveda, and Sāmaveda"
5. *ṛgvedayajurvedābhyāṃ darśapūrṇamāsau* "the full and new moon rituals with Yajurveda and Ṛgveda"
6. *yajurvedenāgnihotram* "the Agnihotra with the Yajurveda'
7. *sarvair agniṣṭomaḥ* "the Agniṣṭoma with all (three)"
8. *uccair ṛgvedasāmavedābhyāṃ kriyate* "(the rites) are performed with Ṛgveda and Sāmaveda (recited and chanted, respectively) with a loud voice"

9. *upāṃśu yajurvedena* "with Yajurveda softly"
10. *anyatrāśrutapratyāśrutapravarasaṃvādasampraiṣaiś ca* "except with the ritual call (*o śrāvaya*), answering call (*astu śrauṣaṭ*), *pravara* (lineage), *saṃvāda* (ritual dialogues) and commands"
11. *antarā sāmidhenīṣu anūcyam* "in the case of the firewood verses the utterance is intermediate"
12. *mandreṇa prāg ājyabhāgābhyāṃ prātaḥsavane ca* "at a low pitch before the *ājyabhāga* oblations (in an *iṣṭi*) and at the morning pressing"
13. *madhyamena prāk sviṣṭakṛto madhyandine ca* "at middle pitch before the *sviṣṭakṛt* oblation and at the midday (pressing)"
14. *kruṣṭena śeṣe tṛtīyasavane ca* "at a high pitch elsewhere and at the third pressing"
15. *vāksaṃdravaś ca tadvat* "and the pace of the voice is similar"
16. *ṛgvedena hotā karoti* "the Hotā performs with the Ṛgveda"
17. *sāmavedenodgātā* "the Udgātā with the Sāmaveda"
18. *yajurvedenādhvaryuḥ* "the Adhvaryu with the Yajurveda"
19. *sarvair brahmā* "the Brahman with all (three)"
20. *vacanād vipratiṣedhād vānyaḥ kuryāt* "when it is stated explicitiy or in case of contradiction another should perform"
21. *brāhmaṇānām ārtvijyam* "the priestly functions belong to brahmins"
22. *sarvakratūnām agnayaḥ sakṛd āhitāḥ* "in all rites the fire is set up once"
23. *juhotīti codyamāne sarpirājyaṃ pratīyāt* "when 'he makes an oblation (*juhoti*)' is enjoined, 'of ghee' should be understood"

24. *adhvaryuṃ kartāram* " as agent the Adhvaryu (should be understood) "
25. *juhūṃ pātram* " as implement (ladle) the *juhū* "
26. *vyāpṛtāyāṃ sruveṇa* " when (the *juhū* is already) used, with the *sruva*.

The structure of these metarules resembles the structure of Pāṇini's grammar in several respects. In 24. 1. 23–26, when nothing else is stated, the entities mentioned (ghee, the Adhvaryu, the *juhū*) are understood. When something else is stated, it prevails, in accordance with the general principle that the exception prevails over the general rule, but also on account of 24. 1. 20. In the final rule, the exception itself is governed by another metarule : when the *juhū* is already used, the *sruva* takes its place. This is in accordance with Pāṇini 2. 3. 1 *anabhihite*, which states that nothing is expressed more than once. The ritual parallel is more or less obvious. While in grammar, the rule blocks an ungrammatical sentence by preventing its derivation, in ritual it prevents impossibilities, viz., that two different priests, at the same time and place, do the same thing; and that different oblations are made, or different things done with one ladle, at the same time and place.

Harold Arnold has drawn attention to another metarule which occurs somewhat later in Āpastamba's *paribhāṣā* section : 24. 2. 13 : *antarāṇi yajñāṅgāni bāhyāḥ kartāraḥ* " the ritual limbs should be inside, the officiating (priests) outside ". " Limbs " refers primarily to the implements, and " inside " and " outside " mean closer and less close to the fire. The Śrauta Sūtra of Satyāṣāḍha uses similar expressions. It seems likely that Kātyāyana's terminological innovations *antaraṅga* and *bahiraṅga* originated in this ritual context. Kātyāyana's Śrauta Sūtra (1. 8. 31–32) expresses similar restrictions, but in a very different way :

31. *haviṣpātrasvāmyṛtvijāṃ pūrvaṃ pūrvam antaram* " with respect to closeness to the fire, each comes before the next in the sequence oblation-implement-patron-priest "

32. *ṛtvijāṃ ca yathāpūrvam* " and the order of the priests is the order of their election " (viz. in which they were elected at the beginning of the performance).

It is conceivable that Kātyāyana the *vārttikakāra*, who introduced the *antaranga / bahiranga* terminology into grammar, wished to avoid this terminology in his ritual work, so that these facts might be taken to be consistent with Thieme's theory of the identity of the two Kātyāyanas. However, the same facts could be used to argue against that theory. All we can say is that they do not automatically disprove of it.

Though the similarity in structure between the metarules from Āpastamba and Pāṇini's grammar is clear, their chronological relationship is not. Pāṇini's *anabhihite* is formulated more abstractly, which might indicate that it is of later date. However, such indications are vague. What is obvious is only the close relationship between ritual and grammar, which serves to underline their traditional complementarity.

Renou has studied the terminological and stylistic similarities between ritual and grammar (Renou 1941–42; also in Staal 1972, 434–469). His conclusions with regard to these connexions are applicable also to the structural, logical, and methodological connexions that we have been concerned with :

> " These stylistic and terminological parallels between ritual and grammatical theory show that we are dealing with disciplines which originated in the same circles, but which answered complementary needs. Both pertain to the practice of the *śiṣṭa*, the specialists ... When dealing with a particular term, it is not easy to establish whether it originated with the grammarians or the ritualists : in the absence of a fixed chronology of texts, and with the general parallelism of techniques in ancient India, such a search becomes arbitrary. However, in the majority of cases it is clear that the point of departure lies in the religious texts. Grammar appears as a specialized investigation within the larger domain of explicit

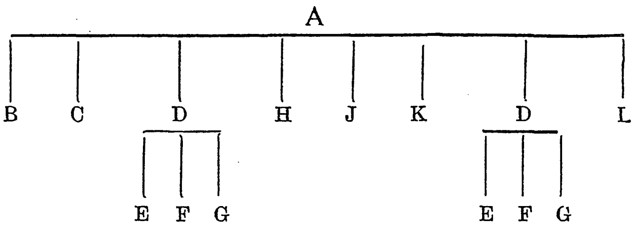
ritual science. The extent and importance of the religious literature, the undeniable priority of the *mantras* and of the ritual forms which they presuppose, invite us to look for origins in that domain."

This is a free translation from Renou's original, and does not quite preserve its inimitable style. Renou was a master in the transparent formulation of matters that are inherently vague and ambiguous. However, in spite of the brilliance of language, the inherent problems remain. The sentence which starts: "Grammar appears..." is a case in point. Yet these phrases appear to come as close as is possible to an appropriate assessment. The only improvement that can be effected is to substitute "Vedic" for the two occurrences of the all-too-Western term "religious."[10]

Two more topics need to be mentioned in the present context. They will be dealt with briefly because I have treated them elsewhere. It is not surprising that the *nyāyasiddhaparibhāṣā* principles converge with the logical principles of the system of Nyāya. Logical principles seem to have been first formulated in Patañjali's Mahābhāṣya, the "Great commentary" on Pāṇini's grammar. These include the principles of the excluded middle ($A \vee \neg A$) and of double negation ($\neg \neg A \supset A$), others that govern two types of negation (*paryudāsa* and *prasajya-pratiṣedha*), and metatheorems such as: $A \supset B, B \supset C, A \vdash C$ (cf. Staal 1963).

The logical structure of ritual is quite different. The rituals constitute a hierarchy, with the simpler ones embedded in the more complex ones. Through recursive constructions we arrive at increasingly complex rituals, that may be represented by structures such as:

10. The inappropriateness of the Western concept of religion in the context of Indian traditions is taken up in Stall, 1982, Volume II, Preface and *passim*.



This tree is used to express that a complex ritual, A, consists of a sequence of rites : B C ..., among which less complex rituals such as D occur. The ritual D itself consists of the sequence of rites : E F G. D may for example represent an *iṣṭi*, and F the *sāmidhenī* rites in this *iṣṭi*. Then, A might represent the Agniṣṭoma, in which several *iṣṭi* rites are embedded. Of course, these representations are not exact; they only serve to illustrate the ritual structure explicated by the Śrauta Sūtras.

These structures, which have been described elsewhere (Staal 1979 and 1980), may also be used in determining the relative chronology of Śrauta Sūtras – in conjunction with other criteria, obviously. The older sūtras sometimes describe embedded rituals when the rituals in which they are embedded are described. Thus, A would be described as : B C E F G H J K E F G L. The later sūtras always deal with the simpler rituals first – describing, for example, D as : E F G. When A is subsequently described, D is merely mentioned and not spelled out. However, the embedded forms of D are often modified, which has to be mentioned. Such modifications can only be described by rules that are essentially transformational in nature.

7. *Options and Arguments*

Methods of argument can be traced back to the Vedas, which often portray discussions and differences of opinion. Well-known puzzles are the *brahmodya* paradoxes of the Ṛgveda that speculate about ritual or cosmology. There is no systematization, but playful repetition occurs in the following example from the Vājasaneyi Saṃhitā of the White Yajurveda :

"I ask you what is the end of the earth?
I ask you where is the navel of the world?
I ask you which is the seed of the horse?
I ask you which is the highest vault of language?
The end of the earth is this altar;
The navel of the world is this ritual;
The seed of the horse is this Soma;
The highest vault of language is this *brahman*"

(after Renou, 1978, 15-16).

The Upaniṣads develop such speculations on the connexions between ritual and man or the cosmos, culminating in the massive identifications of man's essence with *brahman.*

The Brāhmaṇa literature already contained references to the opinions of other teachers. These are systematized in the Śrauta Sūtras. Sometimes these others remain unnamed, and are referred to as *eke*, "some". On other occasions, their opinions are quoted with *iti*, and their names are given. The Śrauta Sūtra of Baudhāyana contains a special section where various options, "*vikalpa*", are enumerated: the Dvaidha section. It quotes the names of numerous authorities, including Baudhāyana himself, and states whose view has been followed in the main text. This shows that the main text is not simply the work of Baudhāyana, but a collective work of a school, in which the views of Baudhāyana and other teachers have been incorporated.

It is quite possible that the Aṣṭādhyāyī is also such a collective work. S. D. Joshi has argued that Pāṇini's grammar would gain consistency if various portions were simply removed from it.[11] Many traditional grammarians were shocked by this revolutionary suggestion, which would cause no surprise to ritualists familiar with the work attributed to Baudhāyana (who was also

11. In another unpublished lecture delivered during the International Seminar on Pāṇini. It was whispered during that conference that if Professor Joshi were right, Pāṇini's contribution would be reduced to a Pañcādhyāyī, at best.

traditionally held to be the author of a Śulva Sūtra, a Dharma Sūtra, and other works).

When referring to options (*vikalpa*), the Śrauta Sūtras use *vā*, but not *vibhāṣā* or *anyatarasyām*, which were systematically distinguished by Pāṇini (Kiparsky 1979). The early history of Indian grammar after Pāṇini has been studied by Kielhorn and Thieme, and is relatively well-known. Kātyāyana's *vārttikas* " supplement, correct, or confirm Pāṇini's sūtras, either with reference to usage, or (more often) in the context of the system " (Renou 1963, 169; cf. Kielhorn 1876). Patañjali has continued this discussion in his Mahābhāṣya, where the *vārttikas* are sometimes defended, sometimes rejected, until a *samādhāna* " removal of doubt " and a *siddhānta* " final conclusion " are reached. Ojihara has recently shown, in a series of articles (1978a, 1978b, 1980), that the *vārttikas* are not " clipped " like the sūtras of Pāṇini. For example, they are not subject to the same principle of brevity expressed by the metarule about the saving of half a mora.

In many Indian *śāstra* works, alternative views are referred to by such expressions as *pakṣe* or *pakṣena*, from *pakṣa* " view ", literally " wing ". In the later commentatorial literature of the great *bhāṣyakāras* Śabara, Śaṅkara, etc., the argument proceeds according to a fixed pattern, starting with the *pūrvapakṣa*, " initial view or hypothesis ", set aside by the *uttarapakṣa*, " counter-view or hypothesis ", until the *siddhānta* is reached. This is reminiscent of Hegel's dialectic, as Romila Thapar has noted[12], but the method is not given a metaphysical status, has no historical significance, and does not embody or welcome contradictions. On the contrary, the *siddhānta* should be reached by logical means only, and is accepted as final – at least for the time being. The *pakṣa* terminology may in fact be traced back to the bird-shaped altar of the Agnicayana ritual, on whose wings (*pakṣa*) the *yajamāna* reaches his final destination.

None of these methods of argument are as precise and sophisticated as the grammatical derivations we meet with in

12. Personal communication (San Francisco, June 1981).

vyākaraṇa. In ritual, the steps are also ordered in linear sequence, but this is generally understood because the sequence of acts is obvious. We have already noted this in our discussion of the *sāmidheni* verses : the *o*'s can only be inserted after the verses have been specified, the fire sticks can only be put on the fire after the fire has been installed and the altar constructed and consecrated, but before the offerings are made, etc.

8. *Conclusions and Final Remarks*

I shall now return to my point of departure and to the claim that ritual and grammar were the earliest sciences in india. I formulated four characteristics of science, which may be roughly referred to as : empirical adequacy, generalization and abstraction› consistency, and methodology. Some of these conditions are easily fulfilled in the case of ritual and grammar, as previous sections have shown, while others require more discussion. For clarity, I shall take them up one by one.

(1) Empirical adequacy. In the Introduction (Paspaśā) to his Mahābhāṣya, Patañjali has formulated the " potter's principle " : " If you want pots, you go to a potter, but if you want words, you don't go to a grammarian ". Where do you go ? To *loka*, the world, for example, the market place where people speak the language. Grammar is a curious enterprise, that may appear circular to those who do not understand it : the grammarians try to derive correct forms, but the correctness of the forms is already known from those who know the language. In fact, in case of conflict, it is the speakers of the language who decide. If grammar provides a derivation of a form that is not used, it is grammar that is wrong. Thus grammar aims at empirical adequacy, and all its efforts are aimed at reaching this goal. Note that this is not different from the situation in physics, that paragon of modern science : physics tries to account for facts with which we are already familiar e. g., that apples fall.

Ritual science is in precisely the same position. The Śrauta Sūtras account for rituals and rites that are performed in accord-

ance with specific traditions. Accordingly, neither grammars, nor ritual manuals are teaching manuals. They can only be understood by people who are already familiar with the subject. They are composed for the sake of the subject only. Other reasons given are mostly rationalizations.

This characterization implies further that both the Aṣṭādhyāyī and the Śrauta Sūtras are primarily descriptive and not prescriptive. But at this point we have to keep in mind, that what was originally descriptive, has become increasingly prescriptive. Pāṇini's grammar originally reflected the usage of the *śiṣṭas*, those who spoke Sanskrit properly; but to later generalizations, its expressions became law, and thus contributed to the fixation of Sanskrit. The ritual sūtras have similarly become prescriptive. Some contemporary ritual performances have been revivalistic in precisely this sense : attempts have been made to *follow* particular Śrauta Sūtras. However, there are also living Śrauta traditions in India. The Nambudiris, for example, follow their own tradition. When told that Baudhāyana describes certain rites differently, they say "Interesting", but would not for a moment consider a change in their proceedings.

Transitions between prescriptiveness and descriptiveness are common in works that deal with language. The American philosopher Quine has noted this in his review of two English dictionaries (1969) : "Scientific linguistics describes and does not prescribe". However, the sales of a Webster Unabridged can only be accounted for because "laymen continued to see its central role as the normative one of establishing correct usage..." "Unlike earlier editions", however, the Webster-Merriam Third International "had gone descriptive. It had shifted its allegiance from what should be to what is. But the public, less nimble in its shifts of attitude, saw the weighty volume still as laying down the law."

The transition from description to prescription indicates increasing dogmatism. We found this already indicated by the *jñāpaka* notion, and the resulting *jñapakasiddhaparibhāṣās*. The

general reverence of the later grammarians for the *trimuni*, "the three sages", Pāṇini, Kātyāyana, and Patañjali, illustrates this further. Even Patañjali himself accepts Pāṇini as an authority, in whose grammar no single element be without meaning or purport (*anarthaka*). However, Ojihara (1978a, 227) has rightly pointed out that this does not imply that Pāṇini's rules are beyond criticism, but that they have to be subjected to a thorough examination in order to find out what is their ultimate motivation (*prayojana*). Wherever precisely we draw the line, my claim that ritual and grammar were sciences in ancient India pertains to the earliest works, the Aṣṭādhyāyī and the Śrauta Sūtras. It does not hold true of the later developments, which did become increasingly dogmatic and scholastic. This may seem to constitute a parallel to the Western transition from Greek science to medieval scholasticism – but as this subject is replete with controversies, I shall not pursue it here.

One feature of description that has contributed to the development of ritual and grammar in India is the *formal* nature of these disclipines. Emphasis on form is a general characteristic of Indian civilization. The Vedas refer more to the forms of language and rites, than to their meanings or function. The Brāhmaṇas introduce large-scale interpretations of ritual, but these can often be shown to be failures. Language is of course concerned with meaning, and semantics is basic to Pāṇini's grammar; however, once the derivations start, they are fully explicit and formal. The Śrauta Sūtras do not provide the rites with any meaning. This inherent formality has contributed significantly to the scientific character of the study of ritual in India.

(2) If grammar, physics and ritual accounted only for what we knew already, the accounting might be interesting but the results would not fail to disappoint us. It is here that generalization and abstraction become significant. Much of the discussions around the texts initiated by the *paribhāṣās* are concerned with this dimension. In another famous passage in the Introduction

to his commentary, Patañjali has explained that the forms of language are infinite, and so cannot be enumerated; only general rules and exceptions can account for them (see e. g. Staal 1969, 501–502). He elucidates this with a reference to ritual, which is equally significant: for the same holds for the *sattras*, or rituals of indefinite duration. Hillebrandt had ridiculed these thousand-year performances, which obviously no human being can engage in. But they give expression to the recursive procedures which constitute the essence of the ritual of the Śrauta Sūtras, and without which they would constitute not a science, but a mere inventory.

The principle of brevity, expressed by the metarule about the saving of half a mora, may contribute to the expression of generalizations, but it is at best a mnemonic device or a game, not a scientific principle. However, Buiskool, Cardona, and others have shown that Pāṇini's grammar is not actually governed by this principle, but formulates rules through functional generalizations. The minimization of syllables has been an end in itself only among minor grammarians.

(3) Consistency is a matter of description or a feature of a theory; facts are always consistent. In grammar, I have already referred to the rule *vipratiṣedhe paraṃ kāryam*, which would have safeguarded the consistency of the grammar if it had been universally available. Whether the Aṣṭādhyāyī is indeed consistent is a matter of continuing discussion. Attempts to save it can be made from various points of view: recourse may be had to emendations of the text, to postulating interpolations, to decomposing and dissecting the text into various layers and portions, or to the *jñāpaka* gymnastics of the later commentators. It is important to note that any of these strategies can only be fruitful when we are dealing with a text such as the Aṣṭādhyāyī, which is basically set up as a logical and rational account of specific area of experience.[13]

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13. By contrast, the dissecting of texts such as the Bhagavad Gītā or the Yoga Sūtras must be entirely arbitrary and fruitless at the present stage of our understanding: Staal 1975, 86.

In ritual, the situation is different. There is less scope for inconsistencies to appear because of the variety of options and schools. The Śrauta Sūtras do not recommend or argue for specific options; they merely describe and analyze the tradition they have selected and opted to follow.[14] Do they not then accept the Vedic injunctions (*vidhi*) enjoining certain rituals for certain purposes? No, not explicitly, for the matter has been entirely ritualized. The Vedic *vidhi* is described only in as far as it is part of the formal declaration of intent (*saṃkalpa*) which the *yajamāna* makes at the outset of a ritual performance. Ritual options, moreover, are compatible, unlike some articles of faith, religious convictions, or philosophical doctrines.[15]

(4) Methods of argumentation have been dealt with in the previous section, and nothing need be added here.

All these considerations support the conclusion that the ritual descriptions of the Śrauta Sūtras, the grammatical analysis of the Aṣṭādhyāyī, and possibly of other early grammatical works, should be regarded as works of science. The degree of scientificality in all these works need not be the same, and their efficiency and successfulness may vary, but this applies to sciences and scientists everywhere.

There are three final observations to be made. It may come as a surprise to many that ritual has anything to do with science. Is ritual not pervaded by magic and superstition? Is the great achievement of science not that it has emancipated from ritual? In India itself there is ample historical reason for such feelings of ambiguity with respect to ritual. The Upaniṣads, Buddhism, the Vedānta, as well as modern secularism – all declare unanimously

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14. I have found no evidence to support the view expressed several times by Renou, apparently following Thieme (e. g., Renou 1941–1942, 441) that the ritual sūtras describe and justify, while the grammatical sūtras describe without justifying.

15. The point has been made by Śaṅkara (in the Introduction to his Sūtrabhāṣya, contrasting *jñāna* which is *vastutantra* with *dhyāna* and *karman* which are *puruṣatantra*); cf. also Staal, 1982, Volume II, Preface.

that ritual is useless and in fact unworthy. By contrast, the authors of the Śrauta Sūtras obviously believed in the efficacy of ritual. At this point we have to pay attention, however, to a remarkable fact: whatever were the beliefs of the authors of the Śrauta Sūtras, these beliefs did not interfere with their science *at all.* I would go further than this, and claim, that there is no modern or contemporary scholar of ritual – whether a student of religion, a social scientist, or a psychologist – who is as little influenced in his studies by his beliefs as the authors of the Śrauta Sūtras were by theirs. However, what is true of the Śrauta Sūtras, is neither true of the Brāhmaṇas, nor of the later Mīmāṁsā. The Brāhmaṇas indulge in unhampered speculation, and are as arbitrary as contemporary trends in the study of religion. The Mīmāṁsā, on the other hand, is a system of philosophy that adheres to the axiom that the Vedic *dharma* as expressed by the *vidhi* injunctions is conducive to the highest good. The Mīmāṁsā has paid much attention to specific ritual problems; but the Indian tradition is on the whole right in classifying it as *darśana*, "philosophy". It became increasingly philosophical when it took to arguing with the Buddhists. The Śrauta Sūtras are different from the Brāhmaṇas and Mīmāṁsā both, and I regard only their efforts and achievements as scientific in nature.

At the outset of this study I referred to attempts that were made to establish that science is exclusively Western. In the course of this essay I have not shown that science in the more conventional sense – viz., "positive" science – did actually originate in India. The reason is simple; it did not. India has known excellent mathematicians and astronomers, and has evolved chemistry, medicine, and other natural sciences. In all these respects she is on a par with other early civilizations. However, it is with respect to sciences of man such as ritual and grammar that the Indian contributions have not only been outstanding, but probably unique.

In our contemporary world, the significant thing about the sciences of man is that they have been so badly neglected. It

has become a cliché to state that man understands the stars but not himself. Alas, what the cliché expresses is true. There is no doubt that the strength of contemporary science lies in the mathematical, physical, and biological sciences. Fads and flurries here and there have not yet changed that basic picture of our civilization. The contributions made by the contemporary humanities and social sciences are comparatively dismal. These disciplines continue to get embroiled in discussions about methodology, autonomy, relevance, and other outright metaphysical issues. The best that some of them have evolved is a narrow empiricism. Some facts have indeed been amassed. Rational speculation has generally been absent, and theories have been rare and haphazard. There is excitement about fashions but no sense of progress. It has in fact been argued that the sciences of man cannot be sciences, and that they require unique categories such as "Verstehen" that conflict with all rational approaches - as if man could in principle not be studied objectively, that is, studied at all.

Linguistics is the only field of study that has finally escaped from the traditional humanities and the behavioristic biases of the social sciences, and has emerged as a scientific discipline. It is therefore not in the least surprising that in recent years significant similarities have been discovered between contemporary linguistics and the Indian *vyākaraṇa*.

In the field of ritual the situation is different. There is nothing in contemporary research that resembles or even approaches the scientific achievements of the Śrauta Sūtra.[16] This is certainly not due to the fact that humans do not engage any longer in ritual. We do, and so do our animal relatives, whose rituals have actually been neglected less. What we lack is not rituals, but ritualists, and a science of ritual. For these reasons it is not merely interesting that the ancient Indians had a science of ritual. Nor is it simply a fact that may help us to

16. Unless it is (indirectly) derived from these sūtras, as Hubert and Mauss, 1897-1898.

better understand India and Indians. The science of the Śrauta Sūtras is the only science of ritual that we are in a position to study and contemplate. It will inspire us once we realize ourselves that we need to create and develop such a science.

The third and last observation I wish to make is this. It is clear that no science of ritual would easily fit into the customary subdivisions of academic disciplines. Though Sanskritists have greatly contributed to the study of ritual, its science does not belong to the humanities as it is independent of language and is moreover concerned with other animals than only people. Nor is it a natural or a social science. Social sciences lack the tools to analyze it, and rites are often performed by single ritualists outside any social context (e. g., in Tantrism). Some of these comments apply to linguistics. In the United States, linguistics has been incorporated among the social sciences partly because these were at one time believed to attract financial support more easily than the humanities. Practical considerations aside, the case of ritual demonstrates that existing classifications of the sciences – and especially the alleged distinction between sciences and humanities – lack a serious foundation.

LECTURE II

EARLY INDIAN HISTORY AND THE SCIENCE OF RITUAL

1. *Introduction*

Every science deals with facts and includes an inventory and detailed description of such facts. When facts are properly presented and documented, they are of value not only to the discipline under whose auspices they were gathered, but to other sciences as well. Malinowski went so far as to require that a theorist should present his ethnographic data so fully that a critic could use them to set up a different theory and thereby refute him. There is indeed a certain complementarity between theories and facts. Just as the same theory can be corroborated by different facts, the same facts can corroborate different theories. There is actually a theorem of logic which implies that there are infinitely many theories to account for any given collection of facts.

The detailed descriptions of linguistic facts provided by the Indian grammarians have thrown considerable light on contemporary facts, and thereby on early Indian history. The best, though controversial example, is Patañjali's illustration of the present tense of the verb by means of the sentence : *iha puṣyamitraṃ yājayāmaḥ*, "here we are officiating at Puṣyamitra's ritual". Since Puṣyamitra was a king known to have ruled around 150 B. C., and since it was assumed that Patañjali illustrated the use of the present tense by referring to a present event, Bhandarkar concluded that Patañjali must have lived around that time. This has long been regarded as one of the few reliable dates in early Indian history. In fact, the entire chronology of the later Vedic period, set up so as to be consistent with the sequence Pāṇini-Kātyāyana-Patañjali, touches base with Patañjali only.

Weber did not accept Bhandarkar's conclusions and argued that Patañjali could easily have taken the quote from an earlier grammarian. Bhandarkar retorted that a good grammarian would not illustrate the present tense with a past event.[17] The discussion on Patañjali's date has not ended, new facts have come to light, and old facts have been reinterpreted. Frauwallner (1960) has tried to show that Patañjali misquoted a text which he misunderstood and which is of later date. He has therefore argued that Patañjali, too, must have lived later than 150 B. C. Kiparsky (1979) has shown that the gap between Pāṇini and Patañjali must have been larger than is generally assumed. Patañjali did not know how to interpret several important terms and concepts in Pāṇini's grammar. Kiparsky has persuasively argued that there must have been a break or breaks in the tradition between Pāṇini, Kātyāyana, and Patañjali.

The validity of Bhandarkar's argument depends on one's assessment of Patañjali as a grammarian. I believe not only that Bhandarkar was an excellent scholar, but that Patañjali was a great grammarian – albeit not a creative genius of the format of Pāṇini. I am therefore inclined to assign Patañjali to 150 B. C. Frauwallner himself is so confused, that not much can be made of his argument.[18] If the gap between Pāṇini and Patañjali must be widened, I would place Pāṇini earlier than is generally assumed. If his work is the cooperative work of a school, its redaction would have taken a longish period. An early date is furthermore consistent with our earlier conclusions with regard to the relative chronology of Pāṇini, the Śrauta Sūtras, and the Prātiśākhyas.

The grammarians have of course provided many other facts that can be used for historical reconstruction. Agrawala has reviewed many of these in his book "India as known to Pāṇini" (1963). If the Indian science of ritual is as much of a science

17. I have simplified this controversy which has dragged on for long time : see Staal 1972, 78–84; cf. Cardona 1980, 263–266.

18. Cardona (1980, 259) writes : "Frauwallner either misunderstood or refused to understand the context of Patañjali's discussion."

as *vyākaraṇa*, it should also provide data for historical reconstruction. The ritual descriptions are in fact so detailed and precise that historical conclusions can be drawn from them. Weber engaged in this pastime in several essays in his " Indische Studien ". I believe that the Śrauta Sūtras can be used to reconstruct Vedic as well as pre-Vedic events.

The general background against which such reconstructions have to be understood is the civilization of the Yajurveda. The Yajurveda occupies the center of Vedic culture—unlike the Ṛgveda which has always remained curiously alien to India (see especially Renou, 1960). The Yajurveda constitutes the foundation of the ritual and of the edifice of the Vedic schools. It is extremely well organized and possesses all the auxiliary texts that define a Vedic school and that the other Vedas have emulated only to some extent. This is illustrated by Sāyaṇa's often quoted statement: " the Yajurveda constitutes the wall, the other two Vedas the paintings on that wall " (*bhittisthānīyo yajurvedaś citrasthānīyāv itarau*). Renou has concluded : " c ' est par le Yajurveda qu'on peut espérer comprendre la formation même du védisme " (194 , 210). It is possible to go even further. More distant from the Indo-European and Indo-Iranian background than the Ṛgveda, the Yajurveda exhibits a more Indian flavor, is closer to the beginnings of Hinduism and Buddhism, and preserves features of earlier Indian cultures.

The Agnicayana ritual occupies in all these respects a similar position. It is the most celebrated of the rituals of the Yajurveda. While it is not mentioned in the Ṛgveda at all, its descriptions and interpretations take up more than a quarter of the combined bulk of the Saṃhitās and Brāhmaṇas of the Black and the White Yajurvedas. Though it incorporates the Indo-European fire cult and the Indo-Iranian cult of Soma, these begin to be overgrown by numerous features that are not found outside India. These features are not Indo-European or Indo-Iranian, but are recognizably Indian. The Agnicayana shows us India beginning to assert herself.

What historical conclusions can be drawn from the descriptions of this ritual in the Śrauta Sūtras? No definite conclusions, obviously, i. e., conclusions that are 100% certain. Historical reconstruction is a matter of probability and we can only come up with speculations. It is true that history has also access to harder facts: the data from archaeology, to which I shall return. But the interpretations of such facts are as speculative as the conclusions drawn from the Śrauta Sūtras.

2. *A Speculative Controversy*

Speculations are speculative but they are also necessary if any science is to make any progress. In order to elucidate this, I shall begin by drawing attention to an earlier publication which led to some controversy. I refer to my article "The Ignorant Brahmin of the Agnicayana", which was commented upon by Dr. C. G. Kashikar in his article "Agnicayana: The Piling up of *svayamātṛṇṇā*" (both were published in the *Annals of the Bhandarkar Oriental Research Institute*, in 1978 and 1979 respectively). I do not intend to criticize Dr. Kashikar's criticisms in detail, for there is a law of diminishing returns and I would have to repeat some of my arguments.[19] However, I would like

19. These strictures do not apply to footnotes. Dr. Kashikar is least convincing when he denies the importance of the *svayamātṛṇṇā* and the *avidvān* who is associated with them: "As Staal himself has noted, the *avidvān brāhmaṇa* is not at all involved in the rite laid down in the Śatapatha Brāhmaṇa, which clearly shows that the cooperation of the two is not an estential part of the Agnicayan. The small act cannot be raised to the status of the essence of the ceremony" (page 218). Here Dr. Kashikar has disregarded what I wrote at the beginning of my article: ".. extraordinary importance is attached to them .. If a person who has already performed the Agnicayana once, wishes to perform another Soma ritual but is not in a position to repeat the entire Agnicayana ceremony, it is sufficient for him to put down the three *svayamātṛṇṇā*: 'he need only lay down the naturally perforated ones; for the naturally perforated ones are these worlds; and this built fire altar is the same as these worlds' (Śatapatha Brāhmaṇa 9. 5. 1. 58: Eggeling)" (pages 337–338). That the Śatapatha Brāhmaṇa does not mention the *avidvān* any longer merely shows that he was no longer understood even at that time, which is not in the least surprising if we take

(*Continued on the next page*)

to make use of this controversy to make two comments, one general and one specific. The general comment relates to the nature of scientific speculation, and is therefore relevant in the present context. The specific comment acknowledges a valid point in Dr. Kashikar's criticisms, and is therefore a matter of courtesy.

In order to introduce the discussion I shall outline my thesis very briefly and without adducing any arguments. In the Agnicayana there occurs a rite during which the Adhvaryu cooperates with a personage whom the Śrauta Sūtras call "Ignorant Brahmin". In the course of the ceremonies, the bird-shaped altar is constructed in five layers, each consisting of 200 kiln-fired bricks (this is not exactly true, as there are additional bricks of half-thickness, but this is irrelevant in the present context). On the first, third, and fifth layer of this altar, some "naturally perforated pebbles" (*svayamātṛṇṇā*) are put in the center, and on these three occasions the Ignorant Brahmin cooperates with the Adhvaryu.

I defended the thesis that the cooperation bewteen the Adhvaryu and the Ignorant Brahmin costitutes the essence of the ceremony, which is otherwise inexplicable. It seals the cooperation between two ancient fire cults : the Vedic, represented by the Adhvaryu, and the pre-Vedic, represented by the Ignorant Brahmin. Moreover I argued that the pebbles are Vedic, and the kiln-fired bricks, non-Vedic. Kashikar rejected this entire reconstruction and concluded his article with the statement : "It is, therefore, needless and inappropriate to trace in the Agnicayana the so-called pre-Vedic element."

I believe, in contrast, that the tracing of such an element is fruitful and even necessary, and propose to show this without

(*Continued from the last page*)

into account that the Śatapatha Brāhmaṇa is much later than the Taittirīya texts which mention him. — Though they had never been explained, the "naturally perforated ones" have always drawn the attention of scholars. The most recent study, especially devoted to them, is Malamoud (1975).

trying to defend any particular theory. Now it should be understood that nothing that I claimed is proven. It is merely a matter of probabilities. I estimated when I wrote my paper that my arguments were so compelling, that the ensuing historical reconstruction had a likelihood of, say, 70%. This implied, in my opinion, that it was worth publishing, which it would not, had the probability been less than, say, 50%. Dr. Kashikar's criticisms included several valid points which would lead me to reduce this probability to, say, 60%. I shall later present fresh arguments which will increase it again to at least 70%. The point to be made here is that we are not dealing with certainties but with theories, viz., speculation and probability.

The key phrase in the discussion is "the so-called pre-Vedic element". Before I revert to this, however, I should make my second, more specific comment. I translated a phrase of Taittirīya Saṃhitā 2. 5. 8. 1 in such a way as to imply that the Ignorant Brahmin incorporated his own, non-Vedic fire cult into the Vedic fire-cult of the Adhvaryu. Dr. Kashikar correctly pointed out that my translation was wrong, because the subject of the sentence is the Adhvaryu, not the brahmin. However this correction implies, on my account, that the Adhvaryu incorporated his Vedic fire cult into the non-Vedic fire cult of the Ignorant Brahmin. Since the gist of my theory was that there was cooperation between the two, the mistranslation does not affect the probability of the theory and supports it just as well.

Let us return to the value of speculation, a method much underdeveloped in the contemporary humanities. The ancient Indian grammarians and ritualists were not afraid of speculation, and contemporary, "positive" scientists exploit it to the fullest extent. This is well known with regard to theoretical physics, a subject as imaginative as pure mathematics, and yet the foundation of most of our present-day technology. However, I shall give a different kind of illustration, taken from biology, to be precise: from the theory of evolution. I do this because it is well known that evolution is a theory, viz. that it is not 100% certain. Since its measure of probability is only between 99%

and 100%, there have been crackpots demanding that "equal time" be given to the Christian theory of creation. I shall refer to biological theories that have a much lower degree of probability than 99%, and yet are seriously discussed and of great interest.

The traditional idea about life has been for a long time that it consists of animals and plants. In due course, other living things were met with that do not clearly resort under either category: protozoa, bacteriae, algae, and various other slimy beings. Fossil evidence for all these forms of life is available for roughly the last one billion years.

Though no one can prove it, it is commonly speculated that our planet came into being about four and a half billion years ago. During most of that period the conditions were such, that life could very well have existed. However, there is no fossil evidence to prove it. And so speculation has set in at this point. Scientists have concluded from the facts and mechanisms of DNA composition, that another class of microscopic beings, baptized *archibacteriae*, should have existed for the last three and a half billion years. Many properties of these beings are known, though there is no direct evidence for their existence. The arguments, however, are good. Nobody is 100% convinced, but nobody is upset, because every scientist knows that the life of scientific theories in general depends on precisely such speculations. Before long, there may also be practical applications (in medicine, in particular), which still don't prove that the theories are valid, but add further to their degree of probability. The theories themselves are kept around until they are disproved or replaced by better theories.

Let us return to early Indian history. Sanskrit scholars are of course obsessed by the Vedic tradition, which is undoubtedly one of the most impressive traditions in the history of man. Though almost entirely oral, it has continued for some 3,000 years, and has been remarkably firm and consistent. However, it should be remembered that its beginnings were tiny, so tiny as

to be almost invisible in a large country like India. The Ṛgveda originated within a small community as is still indicated by the fact that it consists largely of "family books", obviously composed by a handful of people who were wandering bards in small semi-nomadic clans. I do not know how many people lived in India during the last centuries before 1,000 B. C., but if a census had been taken, I would not be surprised if the censor would never have come across a single "Vedic" Indian. The significance of the Vedic Indians lies entirely in the phenomenal success of their tradition during later periods, and in the remarkable fact that we have access to these ancient traditions because of the extraordinary feat of their preservation by the brahmins of India.

At this point I should refer to a widespread fallacy that may be called the "Harappan fallacy", or even the "Dravidian fallacy." There are scholars who claim that everything Indian that cannot be found in the Ṛgveda or traced back to the Indo-Iranian background, must be Harappan, or even Dravidian. What we actually know is this. There is no uncontroversial archaeological evidence which singles out a "Vedic element". The gap between the Ṛgveda and the Yajurveda is wide. The former is largely Indo-Iranian, the latter only to a small extent. The Yajurveda is pervaded by the ritual that the Śrauta Sūtras describe and analyze. At this point speculation must begin. It makes sense to speculate that there must be pre-Vedic elements in the ritual traditions, and find arguments for particular elements of that kind. Such speculation is necessary even for Vedic scholars, for it may explicate some of the differences between Ṛgveda and Yajurveda.

In such reconstructions of early Indian history the archaeological evidence plays a similar part as does fossil evidence in the theory of evolution. We must interpret such evidence in the light of theories, and go beyond the evidence when it is too meagre. Both are purely speculative moves. But if biological speculation can add two and a half billion years to the story of life on earth, Indologists are entitled to speculate about a few

centuries of early Indian history. Serious Indologists, Vedists, and Sanskritists ought to do that, and a great deal more.

3. *Naturally Perforated Pebbles in a Wider Perspective*

I have now cleared the ground and shall present some further speculations. We may as well start with a fact. The altar of the Agnicayana is not only absent from the Ṛgveda, but it is very different from anything we meet with there. In the Ṛgveda, three altars are mentioned, but the shape of an altar is mentioned only once, and indirectly. ṚV. 10. 114. 3 is a late riddle that mentions a girl with four tufts (*catuṣkaparda*) who is butter-faced (*ghṛtapratīka*). The mention of butter makes it clear that a fire is referred to (cf., e. g., ṚV. 5. 11. 1), and the riddle implies that the altar on which this fire was installed was quadrangular (cf. Potdar 1953, 73).

Apart from this single reference, various rites are referred to in the Ṛgveda that seem to have been performed on a piece of consecrated soil. This is clearly Indo-Iranian and reflects the culture of the Indo-Iranian nomads before they entered the Indian subcontinent. Mary Boyce's description is suggestive :

> The Indo-Iranian religion was shaped, it seems, during millennia of wandering on the steppes of Inner Asia, and materially it was accordingly of extreme simplicity. Worship was offered to the divine beings without aid of temples or altars or statutes, and all that was needed for solemnizing the high rituals was a clean, flat piece of ground, which could be marked off by a ritually-drawn furrow. The offerings consecrated there were made not only to the invisible gods, but also to fire and water, which could properly be represented by the nearest domestic fire and household spring, although a ritual fire was always present within the precinct itself, burning in a low brazier. (The fire was placed in a low container within the ritual precinct because the celebrating priest himself sat cross-legged upon the ground.) To judge from later practice, this ritual fire was either kindled for the

occasion, or made of embers brought from the nearest hearth. The only continually burning fire known to the Indo-Iranians was evidently the hearth fire, lit when a man set up his home and kept alight as long as he himself lived, a divinity within the house. This was tended with care and received regularly a threefold offering of dry wood, incense and fat from the sacrificial animal. Such domestic fire could readily be carried in a pot during nomadic wanderings, to continue burning wherever the family pitched its tent (Boyce, 1975, 455).

Many features of this description are still applicable to the Vedic ritual. Many simple rites require oblations made into a fire installed on a simple, ritually consecrated piece of ground. Branches or pebbles are used to demarcate the area. The fire is either kindled, or lit from another fire. There are regular offerings, of cource, and the fires are carried round by the priests in clay pots (e. g., during *agnipraṇayana*, "transportation of the fire" in all Soma rituals from the old to the new offering altar).

All these simple forms occur in the Agnicayana, which is always combined with a Soma ritual. The main altar of the Agnicayana, however, is different : the enormous structure of the bird-shaped offering altar to which I have already referred. Its thousand kiln-fired bricks are referred to by the term *iṣṭakā*, which occurs for the first time in the Taittirīya-Saṃhitā, and is subsequently found in the other branches and traditions of the Yajurveda. We also find elaborate references to the firing of the *ukhā* pot, an important emblem of the Agnicayana which is also not mentioned in any earlier tradition either. Taittirīya Saṃhitā 4. 1. 6 provides the mantras that accompany the rites during which this pot is moulded from clay and smoked, after which a trench is dug, the pot placed in it, covered with fire, and baked for three days. All these things are done, according to the mantras, "in the manner of Aṅgiras" (*aṅgirasvat*), the same expression which is used in the consecration of each of the 1,000 bricks. Baudhāyana Śrauta Sūtra 10. 6 states that a second and third *ukhā* pot (obviously spares), and a few of the bricks, speci-

fically named, are treated in the same manner. The terms *dhūpayate* ("fumigate") and *sudhūpita* ("well fumigated") occur in this context for the first time. The verb used for "firing", *pacati,* is common from the Ṛgveda onwards for cooking, baking, roasting, or boiling, but it is used for the first time in these Yajurvedic contexts to denote the baking of bricks.

In an important article, Converse (1974) has argued for the indigenous origin of the Agnicayana construction, because the art of baking bricks, which was unknown to the Vedic nomads, was practised by the much earlier Harappans. Unfortunatelv, Converse has to some extent committed the "Harappan fallacy" by defending an untenable Dravidian etymology for *iṣṭakā,* "brick." Her chief arguments, however, are extremely strong. The art of baking bricks was certainly a characteristic of the Harappan civilization, more so than of the Near Eastern city cultures, where mud bricks were more common than baked bricks. It is obviously true that nomads have no use for bricks. Converse has furthermore drawn attention to a special feature of the firing of the *ukhā* pot, which also applies to the *mahāvīra* vessel of the pastoral ceremony of the Pravargya, an optional rite in the Soma ritual. Unknown to Converse, Kashikar had noted such similarities in his article on Vedic pottery: "Even though the size and shape of this cauldron (*ukhā*) are different, the procedure of preparing it is mostly identical with that prescribed in connexion with the preparation of the *mahāvīra*" (Kashikar 1969, 19). The similarity between the two pots has been further explored by Ikari (1975), and fits in well with the relationships between the Agnicayana and the Pravargya earlier noted by Rönnow and others.

The specific similarity to which Converse has drawn attention is that both pots are fired with the bottom turned up. This even survives in the Malayalam *prayoga* manuals of the Nambudiris, though "upside down" has there become "sideways". Converse explains this feature as follows: "Inverting the pot during firing limits the oxidation in the interior of the pot, and this partial

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reduction leaves the interior black, while the outside fires to a red color because of the full reduction of the clays and washes used."

At this point she employs a speculative interpretation of archaeological data: "It was specifically this inverted firing technique by which the Black-and-Red Ware, the distinctive trait of the indigenous non-Vedic culture, was made black and red!" (Converse 1974, 85). The speculative feature is not the firing technique, but the identification of the "pre-Vedic element." It is not proven of course, but with this speculative observation, everything falls in place. It is therefore probable that the *ukhā* and *mahāvīra* pots, like the bricks of the entire altar construction, represent the "pre-Vedic element."

At this point I should like to quote the final paragraph of my 1978 article, because it offers a transition to the topics with which I shall conclude:

> By this time the reader should have drawn a simple conclusion. If the Ignorant Brahmin and the Adhvaryu (together with his other priests) represent a pre-Vedic and a Vedic fire cult, respectively, and if the background for the bricks of the Agnicayana altar is pre-Vedic, the background for the *svayamātṛṇṇā* pebbles must be Vedic, i. e., inherited by the Vedic nomads from their ancestors in Central Asia and imported by them when they entered the sub-continent. This would at the same time explain the extraordinary importance the Vedic Indians attached to these stones, and the confusion between stones and bricks which subsequently pervaded the Agnicayana construction. There are plenty of facts which support such a view. A cult of perforated pebbles, found in rivers, existed in Central Asia and survived in different forms in China and among contemporary shamans. In later times, it also occurred in India. The Vedic Indians may have found perforated pebbles in the Gandak river, the ancient Sadānīrā, which constituted a barrier to their eastward expansion in the northern plains of the Ganges. This led to the cult of the Śālagrāma, which is a perforated pebble. But such facts and circumstances go

beyond the Ignorant Brahmin and should, therefore, be treated on another occasion (Staal 1979, 347).

The present occasion is as good as any to wind up this discussion. I shall begin with some speculations from Coomaraswamy, which I had always regarded as extremely far-fetched until I noted how well they fit the present context. According to Coomaraswamy (1939), pebbles with holes in them are universal symbols for passages through which it is possible to pass from one world to the other. I am not for symbols, which can generally be used to prove anything; but these openings are, according to Coomaraswamy, the same as the smoke openings made in the roofs of circular huts or tents, which permit the smoke from the hearth to escape. There are shamanistic rites during which shamans climb through such holes. The gods are believed to descend to earth through them, and shamans wear perforated stones as amulets which represent these beliefs. Such perforated stones have been found all over Central Asia, for example by Aurel Stein. In Tibet, they are called *gzi,* they have streaks and " eyes " (*mig*) on them, and are highly valued and considered auspicious.

The Chinese have long been interested in perforated stones, which are miniature representations of rocks with caves, and in particular of the World Mountain. These stones are sometimes placed in miniature gardens that exhibit the same general correspondence between micro- and macrocosm. The sacred mountains are regarded as the abodes of spirits, presided over by a great deity who can be approached through caves and tunnels. At the same time, the perforated stones are models of the celestial palaces of the gods. Their holes correspond to the stars. The expression used in this connection is " cave-heaven " or " grottoed Heaven " : *tung t'ien* 洞天 which also means "fairyland" and " paradise ".

In later times, the miniature rock caves and perforated stones acquired an aesthetic dimension. In T'ang times, collecting fantastic stones was a favorite pastime for cultured gentlemen,

who rivalled with each other in setting up lapidaria. Schafer translated a Stone Catalogue compiled by Tu Wan in the twelfth century A. D. Many of the stones listed are perforated, and several were found in river beds, some of them in Central Asia. Schafer (1961, 8) refers to the last of the Northern Sung emperors, Hui Tsung, as a " notorious petromaniac."

The Śālagrāma cult in India retains several ancient features, that may have come from Central Asia via the Agnicayana. Śālagrāma stones continue to be placed in the foundation of temples in Bengal. Ajit Mookerjee referred me in particular to the terra cotta temple of Haṃseśvarī at Bāṃsabeḍi, Chinsura District, where an especially large number of such stones have been used. The Nambudiris still obtain their *svayamātṛṇṇā* pebbles from river beds in Kerala, just as real Śālagrāma stones come from the riverbed of the Gandak in Nepal. The natural origins of Viṣṇu's Śālagrāma continue to be emphasized, and correspond in this respect to Śiva's Svayambhūliṅga.

4. *Conclusions*

The facts we have mentioned are all clearly connected, and a general picture emerges. Since ancient times the belief was held in Central Asia that caves are the abodes of spirits. Whether this can be traced back to the time that men were cave dwellers themselves can only be guessed. In Central Asia, speculations on the correspondences between micro- and macrocosm led to the importance of perforated stones, which are miniature representations of these cavernous rocks, and which were used for magical and ritual purposes, possibly connected with divination. There are other possible dimensions, for holes have sexual overtones, and pebbles with holes can also be used as beads.

Many of these practices and beliefs survive in Shamanism. These ideas were introduced into China at an early period, and were further developed in Taoist circles. From the T'ang period onward, they acquired an esthetic dimension that survives to the present day in the rock gardens of the Orient.

The Indo-Europeans shared some of the Central Asiatic beliefs about perforated stones. The Indo-Iranians imported them into the Indian subcontinent together with their ancestral fire cult and the cult of Soma, which developed in the mountains they crossed on their way. In India, they met with similar beliefs, another fire cult, and also an advanced technology that included techniques for firing bricks. They adopted these techniques in the construction of a large fire altar piled up from kiln-fired bricks in the Indian manner, but with the addition of their own perforated stones. They continued to believe that the essence of this altar construction was already contained in their own naturally perforated stones. The Vedic nomads contrasted the naturalness of these stones with the artefacts of the sedentary civilization they encountered.

LECTURE III

AVIARY GEOMETRY OF THE AGNICAYANA

1. *Introduction*

We have referred several times to the bird-shaped altar of the Agnicayana which is constructed or "piled up" from one thousand kiln-fired bricks "in the Indian manner." We shall now take a closer look at its construction. This provides at the same time a good example of ritual construction of the more complex kind. It therefore provides a test case for any theory of ritual. As will be obvious from the following descriptions, no existing theory of ritual is in a position to give a rational account or explanation of such a ritual. Generalities that may satisfy individual tastes are neither supported, nor contradicted by the ritual construction, but the vast amount of precise detail is left unexplained. It is clear that it is the task of scientific theories to explain their subject matter not merely in general, but also in detail. However, such explanations are not provided by any of the anthropological theories of ritual I am familiar with (e. g., those of Van Gennep, Lévi-Strauss, or Victor Turner), and *a fortiori* not by psychological theories or theories propounded by scholars of religion that are always very much vaguer. Such theories fail to explain both the structure and the possible meaning of the ritual. One might wonder whether the Agnicayana is perhaps an exceptional ritual that requires *ad hoc* or extraordinary theories. As a matter of fact, it is a good and representative example of a large Vedic ritual. Vedic ritual is complex, just like languages such as Sanskrit or Chinese. However, a theory of language that cannot account for Sanskrit or Chinese is inadequate. (Linguistics, in fact, seems to support the idea, that all languages are equally complex - though not in the same manner.) A theory of ritual that cannot account for the Agnicayana is similarly inadequate, and should be abandoned.

The bird-shaped altar of the Agnicayana consists of five layers, each consisting of 200 bricks. As we have already noted, there are additional bricks of half-thickness, but these will not concern us in the present context. The five layers are consecrated during five days of the ritual ceremonies. During this consecration, the Adhvaryu and the Yajamāna touch each brick and pronounce mantras over it. All these mantras belong to the Yajurveda. The bricks have an individual identity, and many of them have individual names. They generally fall in groups, which also have names. Within each group, each brick is consecrated with a specific, individual mantra. After all the bricks of a particular group have been consecrated individually with their own mantra, they are consecrated with a second mantra, which is the same for all the bricks, and which is called *tayādevata* after its beginning words; and for a third time with a third mantra, called *sūdadohasa.* Most of the bricks are therefore consecrated with three mantras. The *tayādevata* mantra is the same that was used for the consecration of the naturally perforated pebbles : *tayā devatayā'ṅgirasvad dhruvā sīda* "with that God, in the manner of Aṅgiras, sit firm!" (Taittirīya Saṃhitā 4. 2. 4. 1).

Because of the mechanics of this consecration, the bricks are consecrated in a specific order, and are therefore numbered, at least conceptually. The only exceptions are those bricks that do not receive individual mantras. The latter type of brick occurs chiefly in the intermediate layers, viz., the 2nd, 3rd, and 4th. The bricks of the 1st and 5th layer are almost all specifically ordered and therefore numbered.

The specific order of bricks within each layer is extremely complex and has not been fully explained. One of my reasons for providing precise data on these order relationships is to challenge readers to try their hand at an explanation. The Adhvaryu knows the order of the bricks very precisely. He carries it in his head, for the bricks are not physically ordered, and need not even be physically there. The physical deposition of the bricks can be done in any order. It is difficult enough as it is, as we shall see, because of the variety of the shapes and sizes of the

bricks. Once the bricks are physically deposited in any order, they are consecrated in the ritual order. The physical deposition generally takes place on the evening preceding the day of consecration.

In the following pages I shall not be concerned with the consecration of the bricks, which is dealt with in the Śrauta Sūtras and is fully explained in Staal, 1982, Volume I. The main purpose of the present chapter is to describe the shapes and sizes of the bricks, and their configuration within each layer. By thus stripping the Agnicayana down to its pristine form, we have also taken the Veda out of it, divedized it, so to speak. First of all we have detached the Soma ritual with which the Agnicayana is always associated : without its characteristic "Soma-sequences" of *śastra* recitations and *stotra* chants, we have removed the most important Ṛgveda and Sāmaveda contributions and taken the pictures off the wall, in terms of Sāyaṇa's metaphor (see above page 41). By furthermore deleting the mantras with which the bricks are consecrated, we have taken down the wall of Yajurveda itself, and are left with the scaffolding, consisting in this case not of concrete or steel, but of kiln-fired bricks. It is quite possible that what we are left with is a Harappan remainder, but to assert this without further proof would be to commit the Harappa-fallacy.

The size, shape, and configuration of the bricks is one of the subject matters of the Śulva Sūtras. It is dealt with in some detail in Baudhāyana Śulva Sūtra, which corresponds to some extent to the descriptions of the altar in the main text of Baudhāyana Śrauta Sūtra (Chapter 10), and to the optional forms of the altar (*kāmyāś citayaḥ*) recorded in Baudhāyana Śrauta Sūtra 17.28. A translation of these chapters by Y. Ikari and H. Arnold, together with the corresponding sections from the Dvaidha and Karmānta, is published in Staal, 1982, Volume II. Where the main text describes the altar in the shape of a *śyena*, "griffon," or "falcon," the optional forms deal with altars in the shape of mantras (*chandaścit*), a heron (*kaṅka*), an *alaja* bird, a *praüga* triangle, and a chariot wheel (*rathacakra*).

The following descriptions are not based upon texts but derive entirely from information supplied by C. V. Somayajipad and M. Itti Nambudiri, my chief collaborators in the AGNI volumes. This information itself derives from charts, Malayalam ritual manuals, and the oral tradition. It pertains to three kinds of altar which have been constructed in recent times by the Nambudiri brahmins of Kerala. In the first tradition, the wings of the bird have six tips (*ṣaṭpatrikā*). This was the shape of the altar constructed during the 1975 performance. In the second tradition, the altar has the shape of a bird with five-tipped wings (*pañcapatrikā*). This form was constructed once after 1919 A.D. In the third tradition, the bird is square (*pīṭham*). This form was adopted for the last time some 150 years ago.

In all three traditions, the names of the numbered bricks, and of the groups to which they belong, and the mantras with which they are consecrated, are the same. Bricks of half-thickness also have the same number. All other rites and recitations are identical. Therefore, if we know the shape, configuration, and order of the bricks, we are in a position to construct the entire Agnicayana for the five-tipped and square bird traditions by adapting the description of the Agnicayana for the six-tipped bird in Staal, 1982, Volume I.

Though the numbers of bricks are the same in all traditions, their shapes, sizes and configurations are different. There is however a general rule according to which there should be no vertical openings or channels between the bricks on two different, adjoining layers, excepting only at the centre. This problem is solved by adopting an identical configuration for the 1st, 3rd, and 5th layers, and another, not-overlapping configuration for the 2nd and 4th layers. In each of the three traditions, there are therefore two basic patterns. Even though the configuration on some layers is therefore the same, the order of bricks is not. It has therefore to be specified for each of the five layers.

Another feature of the three traditions is that the total area of the altar, viz., of each layer, is seven-and-a-half times a square

puruṣa, i. e., a square of which the side is the size of the Yajamāna. This is in accordance with a tradition also preserved in some of the Yajurveda Brāhmaṇas (see, e. g., Eggeling 1894, Vol. III, 419). I shall show that this tradition is preserved in Kerala by providing the required computations. Such computations do not occur in the sūtra texts, or in any other texts I am familiar with. They are implicit in the data recorded in Kerala. This illustrates that the tradition and the texts based upon it do not provide any information that may be logically deduced from the data given, which accords fully with the scientific character of this ritual discipline.

2. *The Six-Tipped Bird Altar*

The basic unit of measurement for constructing the six-tipped bird altar is called *pañcamī*, " a fifth " of the size of the Yajamāna, measured with his arms stretched out above his head. A measuring stick of his length is equally divided into five such *pañcamī* units, also called *aratni*. They can be measured approximately as 24 *viral*, a Malayalam unit which is absolute and can therefore only approximately render a unit which is dependent on the size of a man.

The same measuring stick is also divided into four, each length called *caturthī*, " fourth ", or *prakrama*, more precisely: *prākṛta-prakrama*, " ordinary *prakrama*." This latter expression is used only in the Agnicayana and not in other Soma rituals, because the Agnicayana requires two slightly larger units: *madhyama-prakrama*, " middle *prakrama* ", and *vṛddha-prakrama*, " extended *prakrama*." These are needed to measure the eastern enclosure or Mahāvedi, which has to be larger than the corresponding enclosure of an ordinary Soma ritual (such as the Agniṣṭoma) because the new offering altar of the Agnicayana, which has the shape of a bird, is larger than the corresponding offering altar in other Soma rituals, which is square.

Figure 1 illustrates the measuring stick with these four units of length. The measuring stick will be used by the Adhvaryu for

making the various measurements required in the construction of the ritual enclosures and altars. Figure 2 shows how the six-tipped bird is measured out, but the details of this outline are not explained here.

The basic unit of a fifth is used to measure the basic sizes of the bricks. There are ten different sizes and shapes, derived from each other in the manner outlined in Figure 3. The following numbers of bricks are prepared:

136	*pañcamī* bricks
48	*sapāda* bricks
302	*adhyardha* bricks
204	*pañcamyardha* bricks
200	*adhyardhārdha* bricks
22	*pañcamīpādya* bricks
4	*eṭṭāṃśi* bricks (these are generally referred to by this Malayalam name, but may also be called by their Sanskrit name, *aṣṭāṃśī*)
12	*śūlapādya* bricks
56	*dīrghapādya* bricks
16	*ubhayī* bricks
Total 1000	

The five layers of the six-tipped altar are illustrated in Figures 4–8. In each layer, the bricks that are consecrated in a fixed order have been numbered.

The number and area of bricks in the first, third, and fifth layers are:

	Number	Area per Brick	Area
pañcamī	38	1	38
sapāda	2	1.25	2.5
adhyardha	56	1.5	84
pañcamyardha	60	.5	30
adhyardhārdha	44	.75	33
Total	200		187.5

The number and area of bricks in the second and fourth layers are :

	Number	Area per Brick	Area
pañcami	11	1	11
sapāda	21	1.25	26.25
adhyardha	67	1.5	100.5
pañcamyardha	12	.5	6
adhyardhārdha	34	.75	25.5
pañcamīpādya	11	.25	2.75
eṭṭāṃśi	2	.125	.25
śūlapādya	6	.375	2.25
dīrghapādya	28	.375	10.5
ubhayī	8	.3125	2.5
Total	200		187.5

For each layer, the total area is 187. 5, which is $7\frac{1}{2}$ times 25, which is $7\frac{1}{2}$ times a square *puruṣa*, since the size of the Yajamāna is 5. It is not known how these computations were carried out.

As can be seen from Figures 5 and 7, as well as from the above table, most of the rare shapes are used in the second and fourth layers. To illustrate the distribution of all the shapes in these layers, Figures 9–18 have been especially drawn by Mrs. Adrienne Morgan.

3. *The Five-Tipped Bird Altar*

The unit square is a fourth, *caturthī*, and there are six kinds of bricks, derived from the unit square in accordance with the method illustrated in Figure 19. The following numbers of bricks are prepared :

327 *caturthī* bricks
416 *caturthyardha* bricks
3 *haṃsamukhī* bricks
236 *caturthīpāda* bricks (three cornered)
9 *caturthīpāda* bricks (four cornered, left-oriented)
9 *caturthīpāda* bricks (four cornered, right-oriented)

Total 1000 bricks.

The five layers are illustrated in Figures 20–24. The number and area of bricks in the first, third, and fifth layers are :

	Number	Area per Brick	Area
caturthī	61	1	61
caturthyardha	96	·5	48
haṃsamukhī	1	·5	·5
caturthīpāda	42	·25	10·5
Total	200		120

The number and area of bricks in the second and fourth layers are :

	Number	Area per Brick	Area
caturthī	72	1	72
caturthyardha	64	·5	32
caturthīpāda	64	·25	16
Total	200		120

For each layer, the total area is 120, which is $7\frac{1}{2}$ times 16, which is $7\frac{1}{2}$ times a square *puruṣa*, since the size of the Yajamāna is 4.

4. *The Square Bird Altar*

In the square bird altar (*pīṭham*) all the bricks are square. There are four kinds, their sides being functions of the size of the Yajamāna (see Figure 25). The following numbers of bricks are prepared :

96 *caturthī* bricks
610 *pañcamī* bricks
234 *ṣaṣṭhī* bricks
60 *daśamī* bricks

Total 1000 bricks

The five layers are illustrated in Figures 26–30. The number and areas of the bricks in the first, third, and fifth layers are :

	Number	Area per Brick	Area
caturthī	24	1	24
pañcamī	120	·64	76·8
ṣaṣṭhī	36	·44...	16
daśamī	20	·16	3·2
	Total 200		120

The number and areas of bricks in the second and fourth layers are :

	Number	Area per Brick	Area
caturthī	12	1	12
pañcamī	125	·64	80
ṣaṣṭhī	63	·44...	28
	Total 200		120

For each layer, the total area is again $7\frac{1}{2}$ times a square *puruṣa*, since the size of the Yajamāna is 4.

5. *Conclusions*

In all these contributions we may distinguish two aspects : the first pertains to geometry; the second to what may be called ritual geometry.[20] The first aspect has to do with the selection of shapes, sizes, and configurations in such a way that three constraints are met : the total area should be $7\frac{1}{2}$ *puruṣa*, the number per layer should be 200, and there should be no vertical openings between adjacent layers. Unless there are additional constraints, there is no optimal solution to the problem posed by these three, and many alternative solutions are possible. It is obvious, however, that several other considerations have also been taken into account : there is a north-south symmetry (be-

20. This distinction between geometry and ritual geometry is not the same as the distinction made by Michacles (1978, 44) between many-layered brick altars (*agni*) which lead to *Vedische Sakralgeometrie* (" Vedic sacred geometry "), and single-layered *vedi* altars which do not. Michaels' distinction itself is based on many-layered confusions.

cause of the shape of the bird), a limited east-west symmetry, and the bricks are approximately of similar size. It is possible that the results as we have them were arrived at by trial and error. Even so, it does not follow that they are arbitrary with respect to the numerous details we cannot explain.

Ritual geometry has to do with the order in which the bricks are consecrated. This order is puzzling, as we have already noted, and it is likely, moreover, that it can only be fully explained if we also take the *groups* of bricks into account, together with their names and consecrating mantras. This information has not been included in the present chapter because it would increase its length by at least ten times (see AGNI, Volume I, pages 387–505). Even so, some general tendencies may be observed in the material illustrated in Figures 4-18, 20–24, and 26–30. For example, consecutive bricks or groups of bricks are often ordered clockwise (*pradakṣiṇa*) : this generally begins in the southern wing and proceeds via the tail and the northern wing to the head or neck of the bird. Moreover, when the bricks are ordered in (more or less) straight lines, or pairwise, there are preferred directions. First preference goes to the eastern direction which the bird faces (i. e., the bricks are ordered from west to east). Next come the northern and western directions, apparently in that order, and the southern direction comes last.

Preference for the east is almost universal and nothing to be surprised about : the sun rises in the east. In Sanskrit man faces east : *dakṣiṇa* means "south" and "right," *uttara*, "north" and "left," and *pratyañc*, "west" and "behind,". (A similar terminology is found among Turkic peoples in Central Asia, but as the testimony is relatively late it is possible that it is due to Indo-Iranian influence.) In India, however, there is a more specific historical background to the predilection for the eastern direction. The Vedic Indians moved primarily in that direction after they had entered the plains, viz., after they had come in contact with local populations. "From the west, people go to the east, conquering lands," says Kāṭhaka Saṃhitā 26.2 (quoted in Rau 1957,

13). During the period that the ritual developed, this eastward movement was largely confined to the northern plain of the Ganges. It was sometimes interrupted. A well-known passage of the Śatapatha Brāhmaṇa (1. 4. 1. 14–17) describes how Agni, "went burning along the land, towards the east," and could not cross the Sadānīrā (Gandak) river, so that brahmins had to spend some time on its banks. We have already noted that they may have looked for perforated pebbles, but as these are found upstream in what is now Nepal, they must have moved in the northern direction.

The eastward marches of the Vedic nomads were accompanied by battles, cattle raids, and the burning of forests. Some eastward marches took place during the cold season, when the indigenous barley crops were seized, men and animals fed, and the troup returned to the western direction before the rains started (Rau 1957, 15). During Yātsattra rituals the entire community moved in the north-eastern direction. At least on one documented occasion they were defeated by indigenous huntresses (Jaiminīya Brāhmaṇa 2. 299).

The south was the region of death and of the ancestors. It continues to be regarded as inauspicious in later Hinduism (see, e. g., Dumont 1953; Staal 1975, 145). This inauspiciousness may be earlier than the other relative predilections, since the indigenous people lived to their south when the Vedic nomads entered the subcontinent. The clockwise movement, which is also the movement of the sun, seems to occur for the first time in the Śrauta Sūtras and remains the predominant auspicious movement in the later traditions of India. It spread over larger parts of Asia, and is also found elsewhere.

All of this is suggestive and it is tempting to assume that the movements of the Adhvaryu and Yajamāna over the altar, in the course of their consecration of the bricks, reflect to some extent the movements of their ancestors, the Vedic Indians. However, we should be careful here. First of all, these suggestions are vague and general; they do not explain the specific order of

particular bricks which it is our business to explain. Second, there is an important difference between possible historical backgrounds and ritual structure or significance. The relationship between the two is similar to that between the etymology of a word and its meaning and grammatical functions : there may be a causal relationship between the two, but the latter cannot be explained by the former. Etymology and historical background have in principle nothing to do with meaning, function, or structure. In the geometrical case discussed before, there were specific constraints explaining at least some features of the shapes, sizes, and configurations. In the case of ritual geometry that we are considering here, we do not know the reasons, and therefore we do not know whether there are reasons for the particular order in which the bricks are consecrated. This is an example of the kind of problem that awaits a new theory. Since no existing approach can handle it, I relegate it to the future science of ritual.

ILLUSTRATIONS

All illustrations are derived from drawings made by Mrs. Adrienne Morgan (Department of Geometry, University of California at Berkeley).

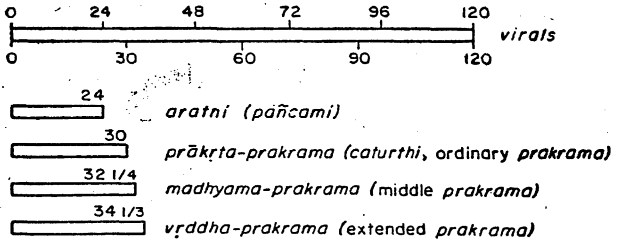

Figure 1 – The Four Basic Units of Measurement

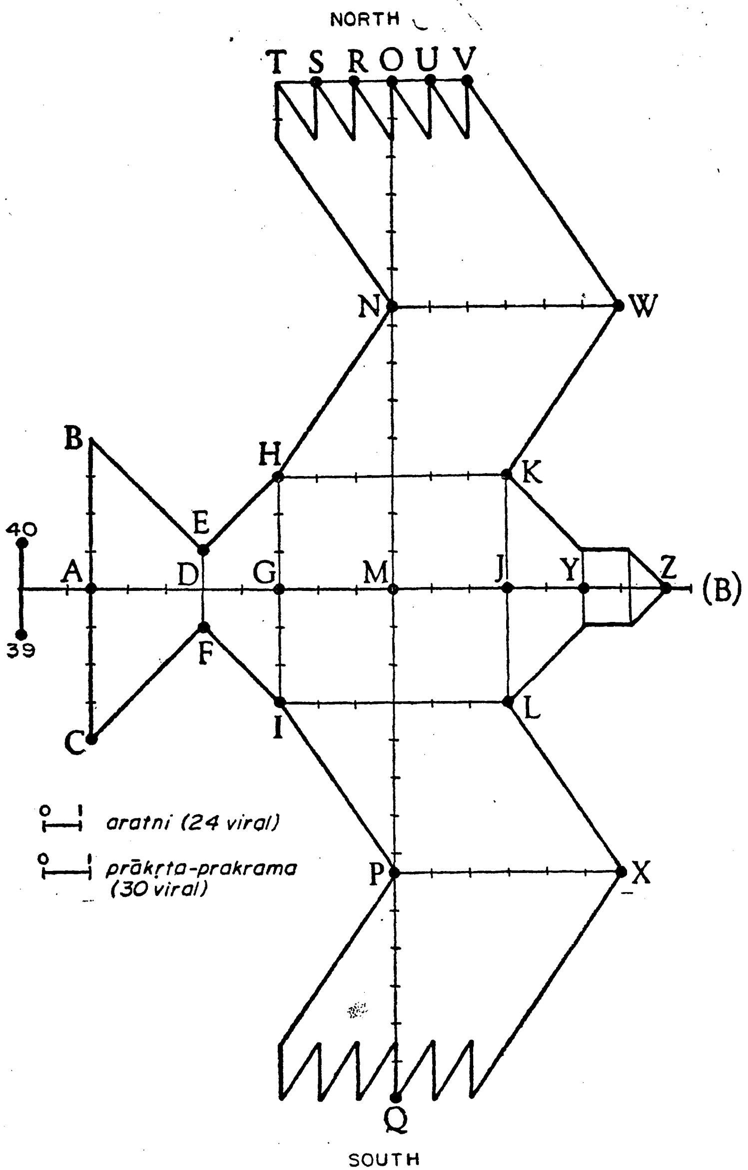

Figure 2 – Basic Measurements of the Six-Tipped Bird Altar

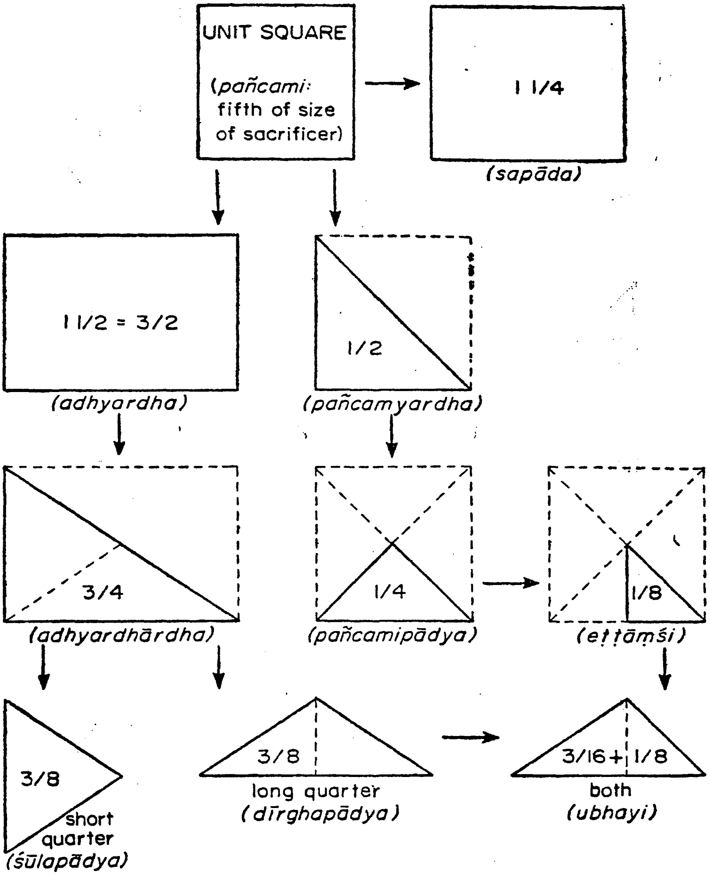

Figure 3 – The Ten Sizes and Shapes of the Bricks of the Six-Tipped Bird Altar

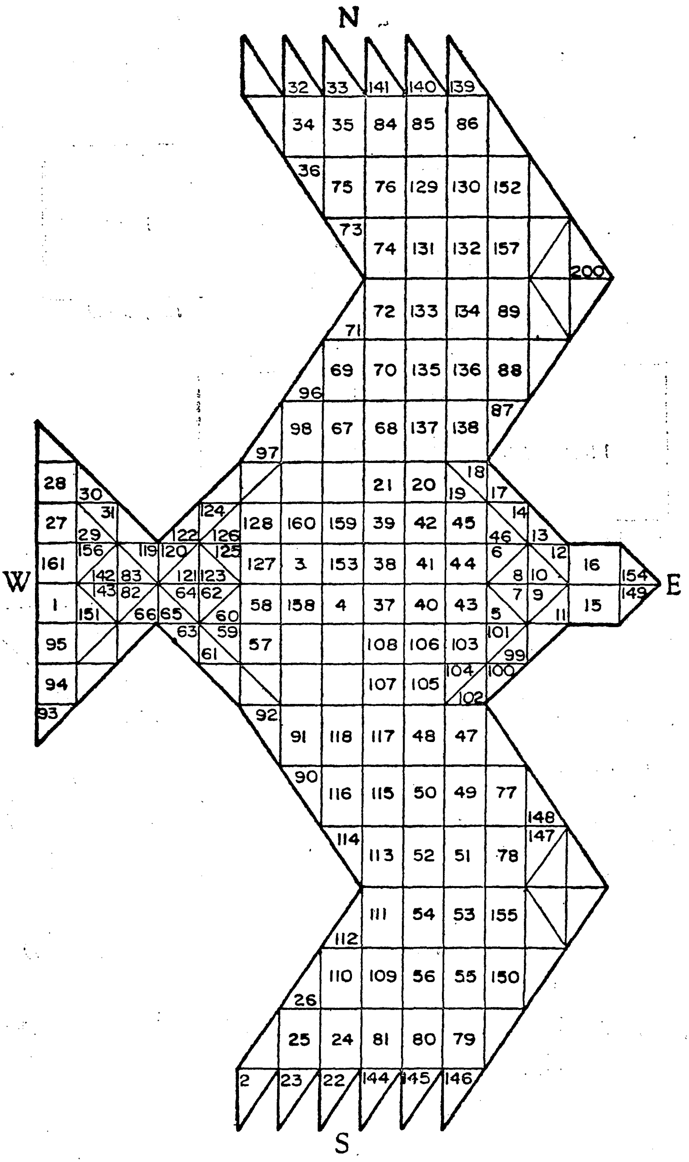

Figure 4 – The First Layer of the Six-Tipped Bird Altar

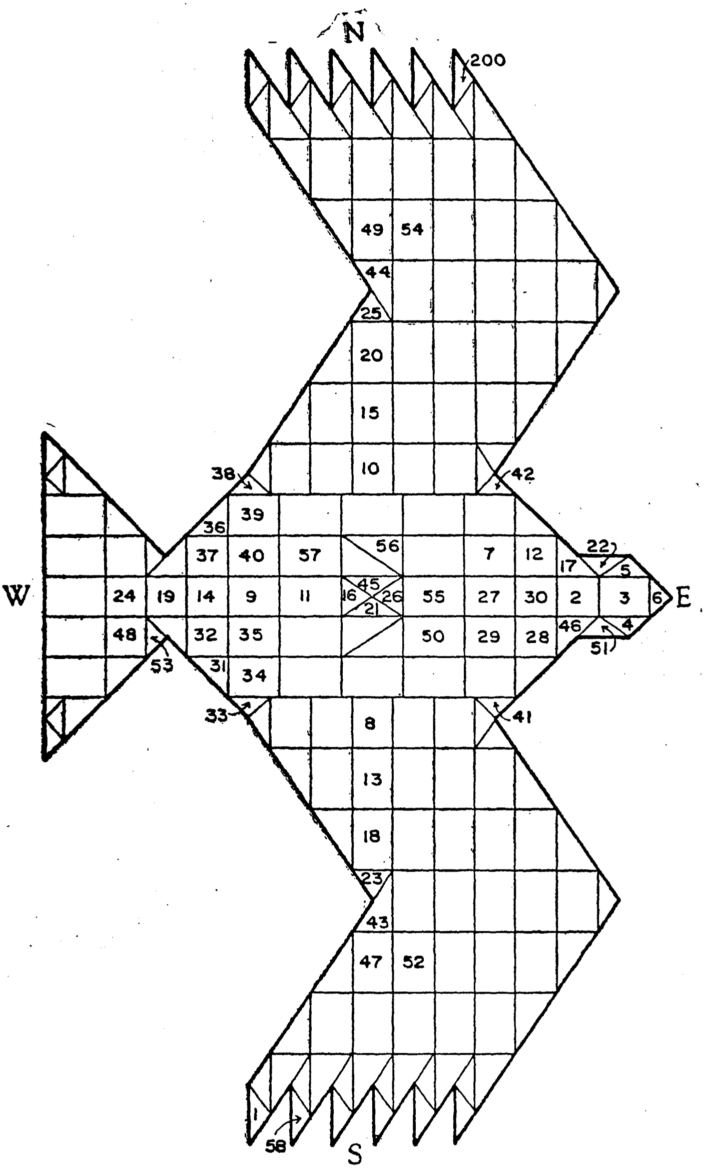

Figure 5 – The Second Layer of the Six-Tipped Bird Altar

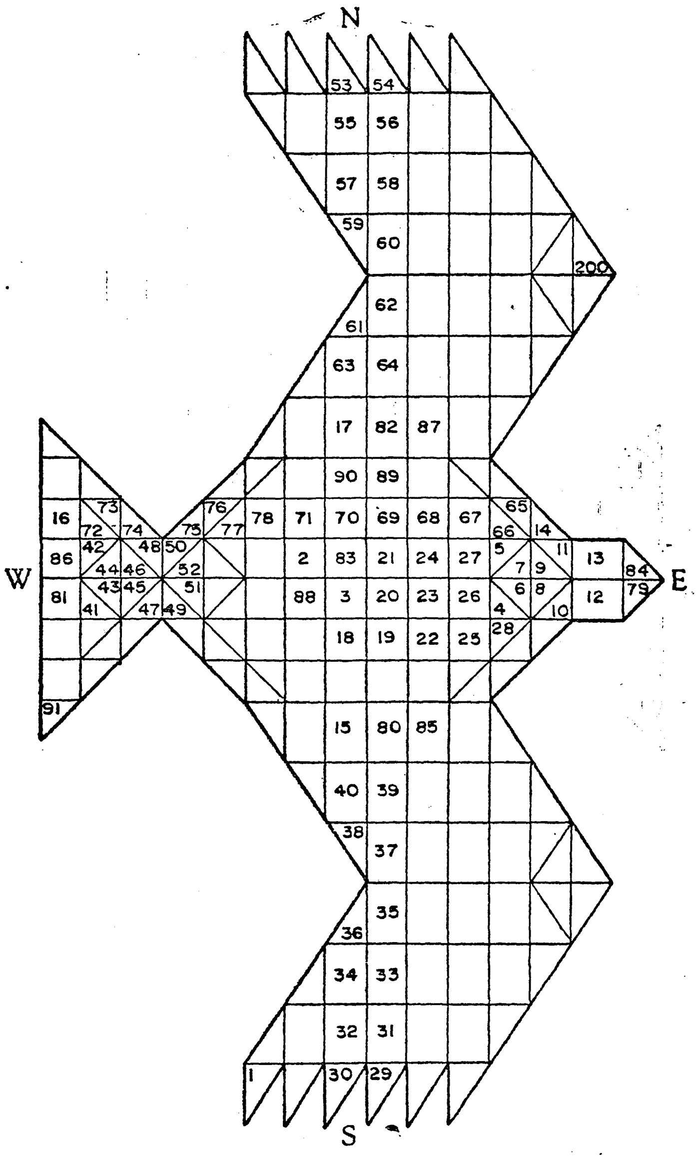

Figure 6 - The Third Layer of the Six-Tipped Bird Altar

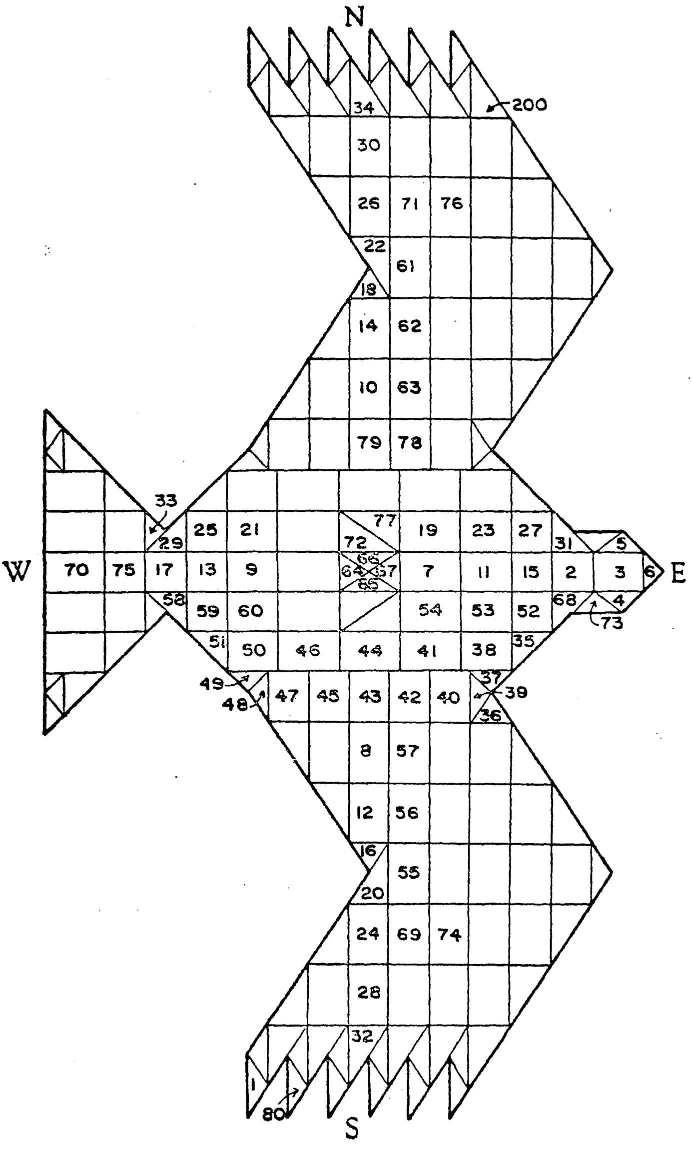

Figure 7 – The Fourth Layer of the Six-Tipped Bird Altar

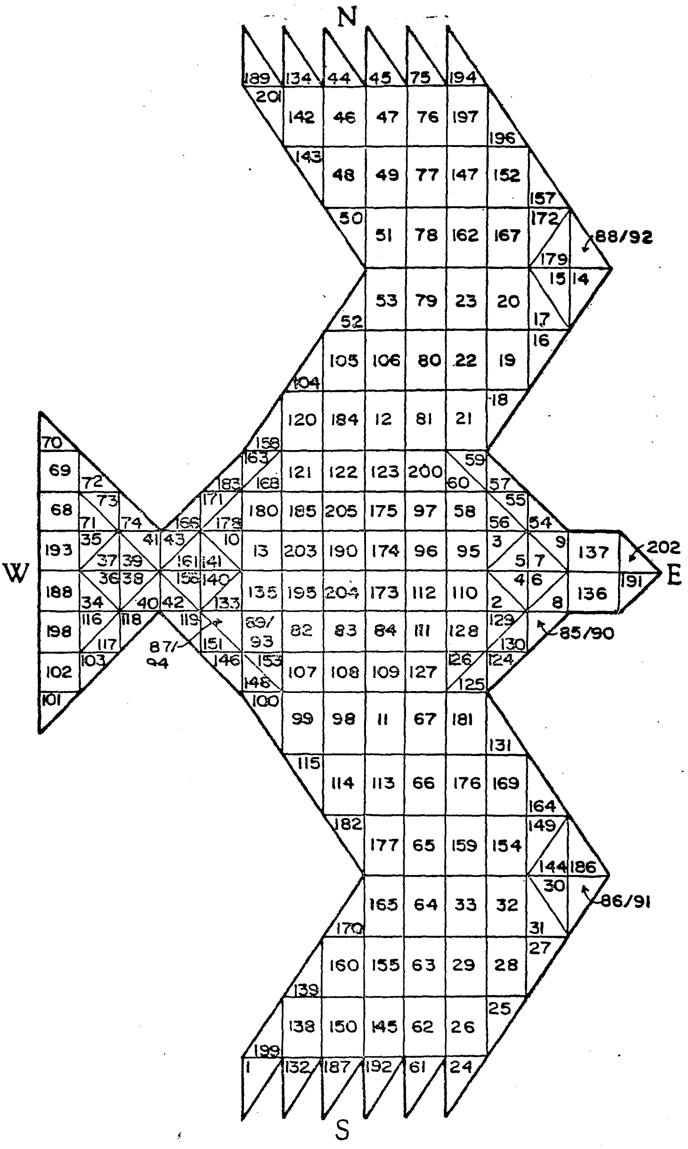

Figure 8 – The Fifth Layer of the Six-Tipped Bird Alta

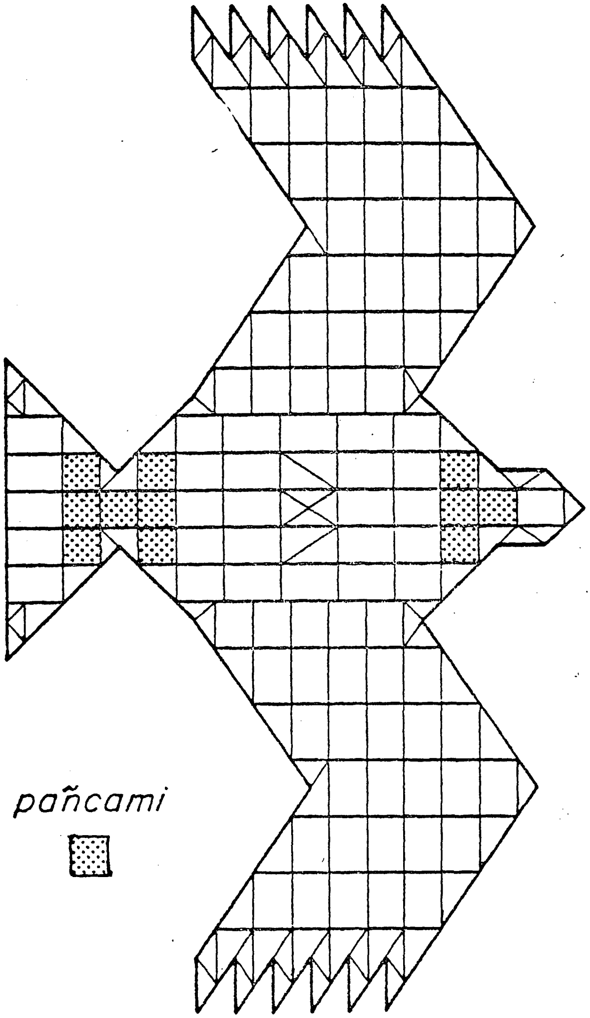

Figure 9 – Distribution of *pañcamī* Bricks in the Second and Fourth Layers of the Six-Tipped Bird Altar

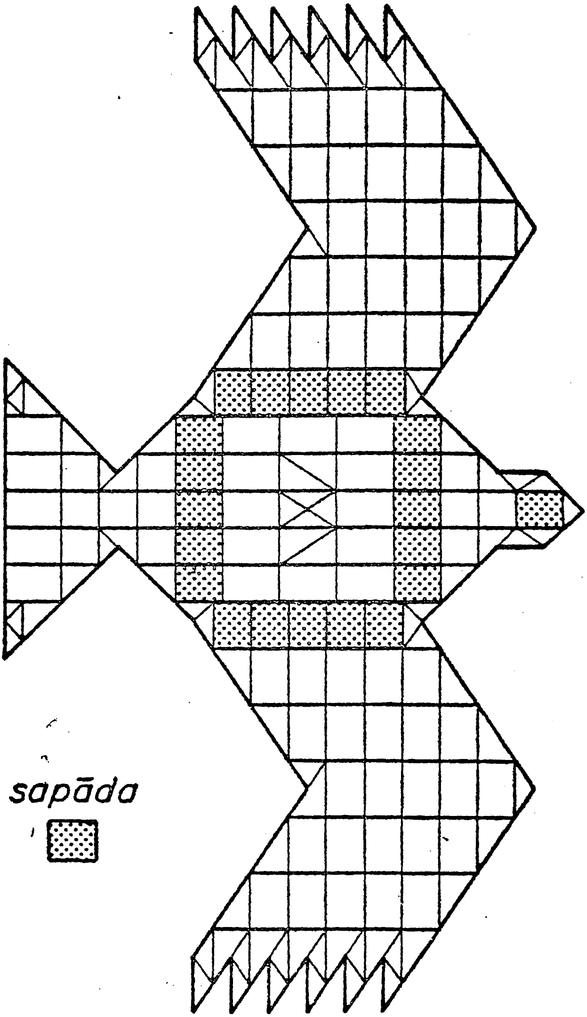

Figure 10 – Distribution of *sapāda* Bricks in the Second and Fourth Layers of the Six-Tipped Bird Altar

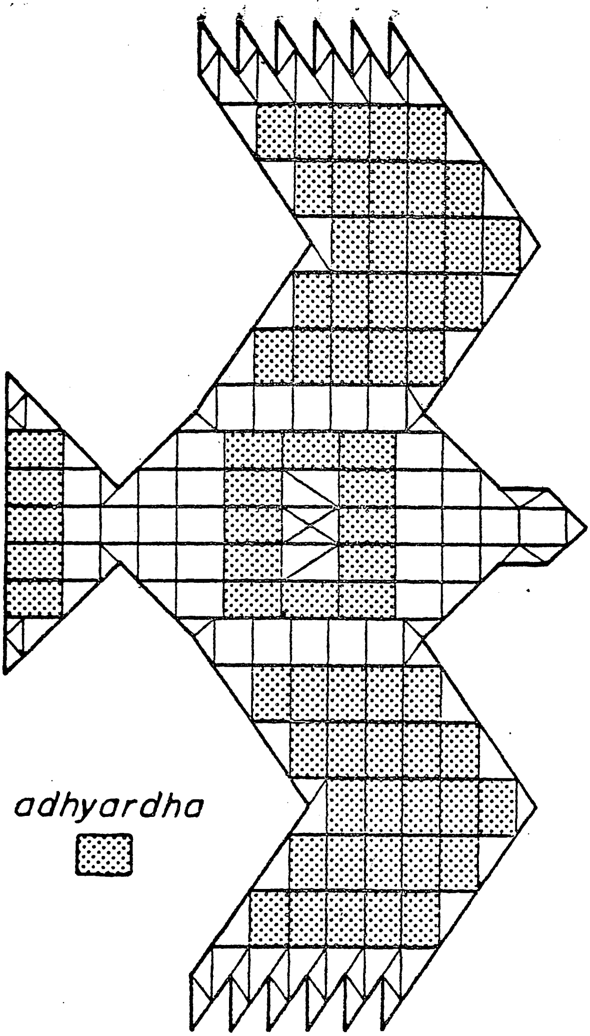

Figure 11 – Distribution of *adhyardha* Bricks in the Second and Fourth Layers of the Six-Tipped Bird Altar

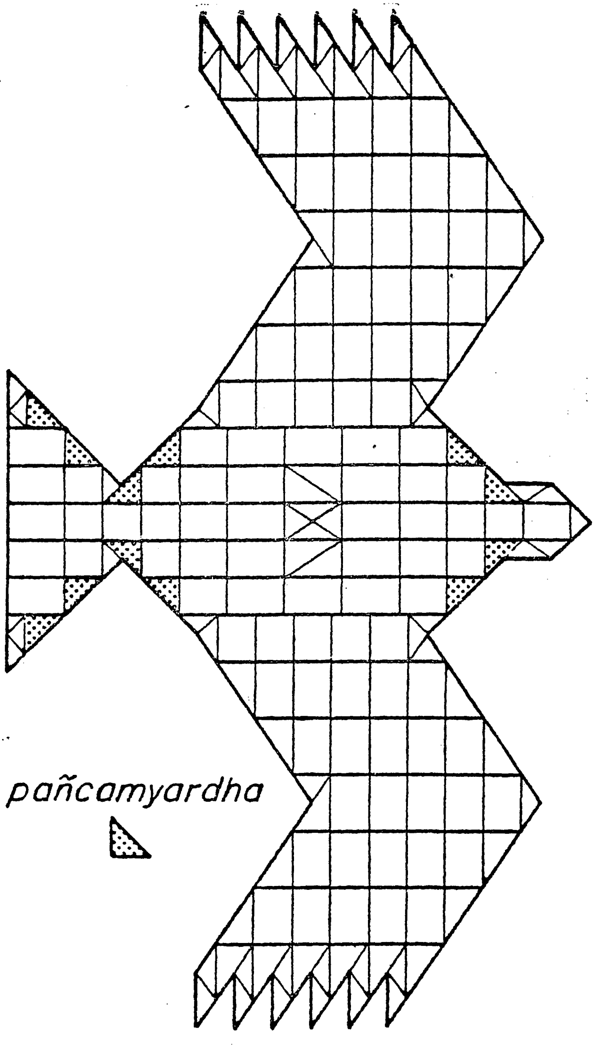

Figure 12 – Distribution of *pañcamyardha* Bricks in the Second and Fourth Layers of the Six-Tipped Bird Altar

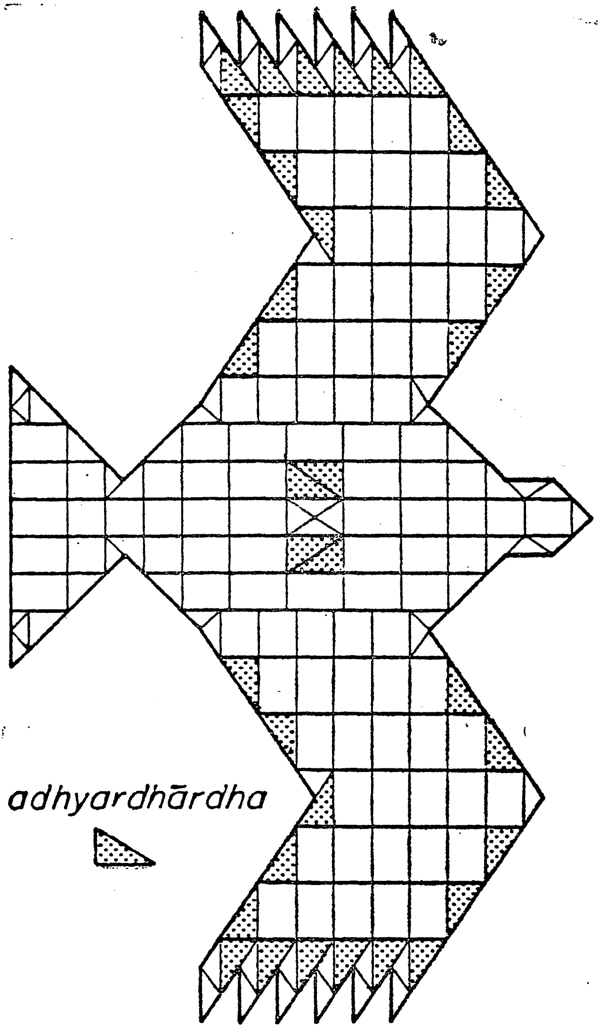

Figure 13 – Distribution of *adhyardhārdha* Bricks in the Second and Fourth Layers of the Six-Tipped Bird Altar

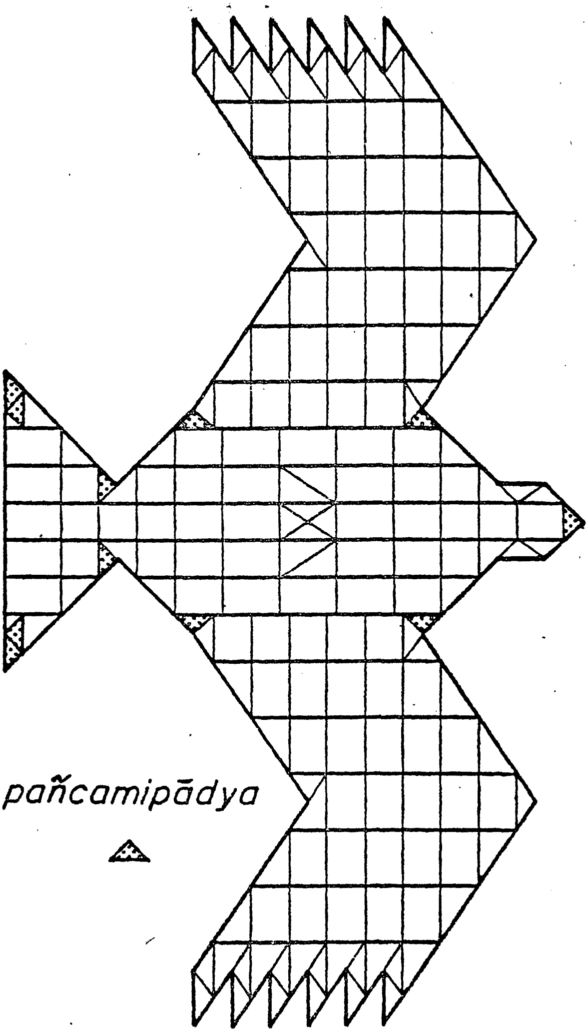

Figure 14 – Distribution of *pañcamīpādya* Bricks in the Second and Fourth Layers of the Six-Tipped Bird Altar

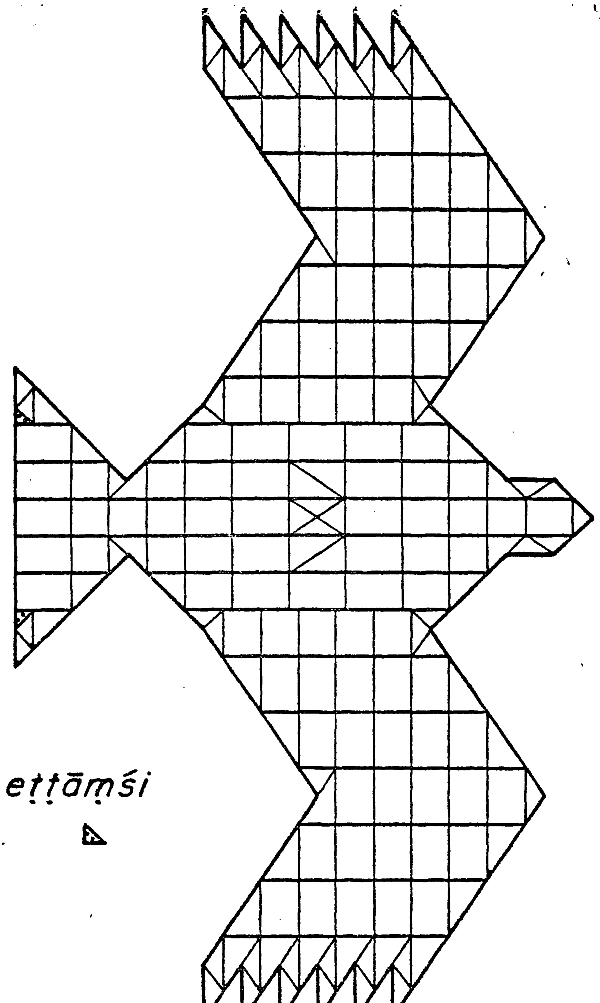

Figure 15 – Distribution of *eṭṭāṃśī* Bricks in the Second and Fourth Layers of the Six-Tipped Bird Altar

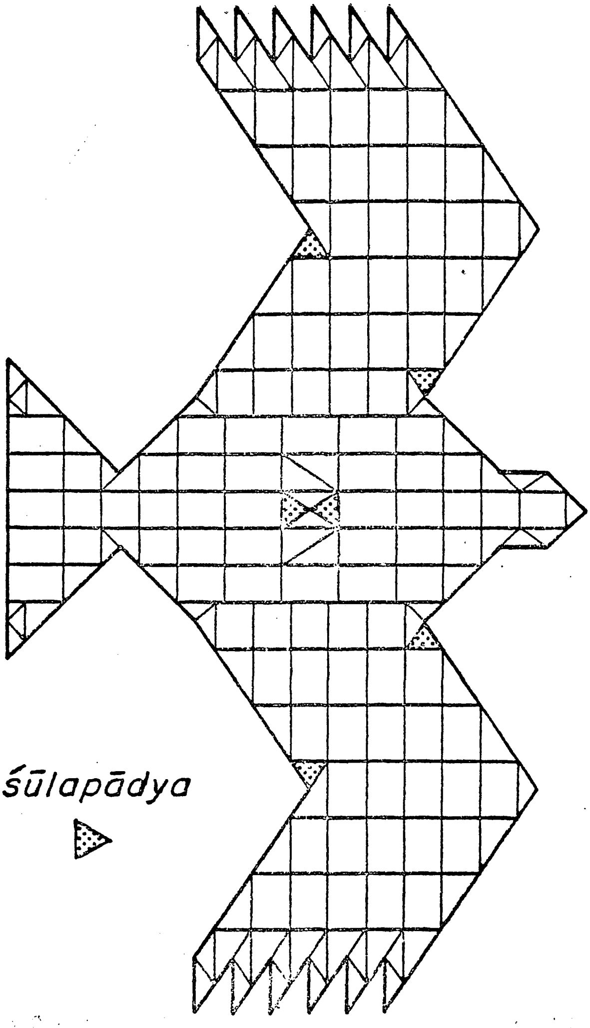

Figure 16 – Distribution of *śūlapādya* Bricks in the Second and Fourth Layers of the Six-Tipped Bird Altar

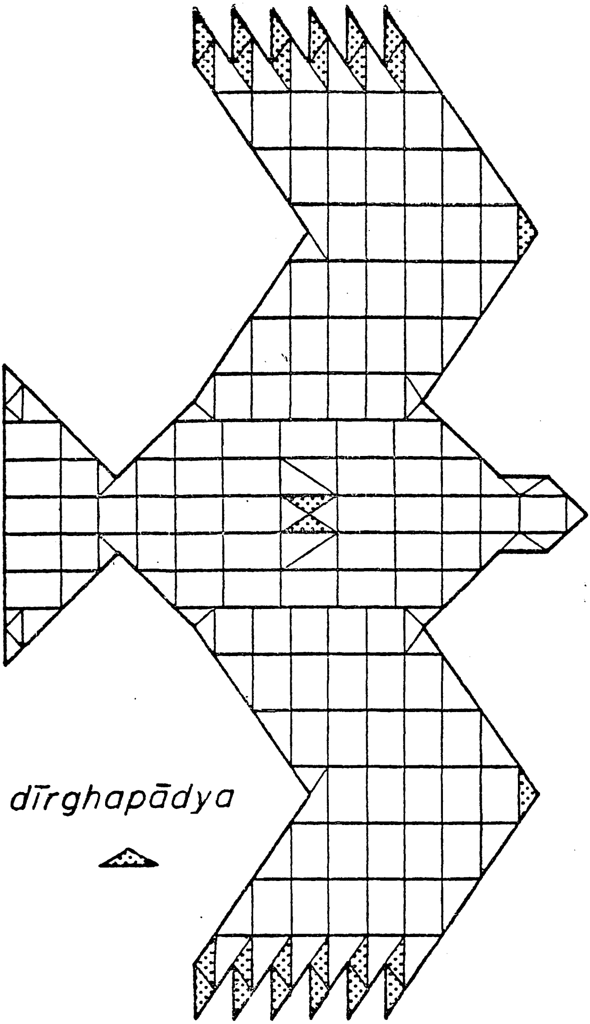

Figure 17 – Distribution of *dīrghapādya* Bricks in the Second and Fourth Layers of the Six-Tipped Bird Altar

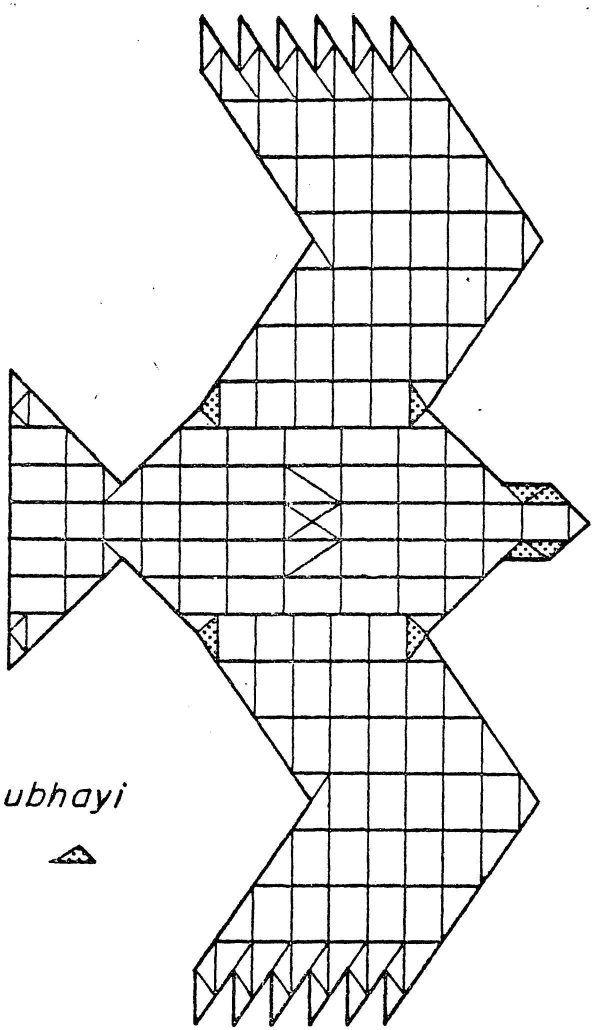

Figure 18 – Distribution of *ubhayī* Bricks in the Second and Fourth Layers of the Six-Tipped Bird Altar

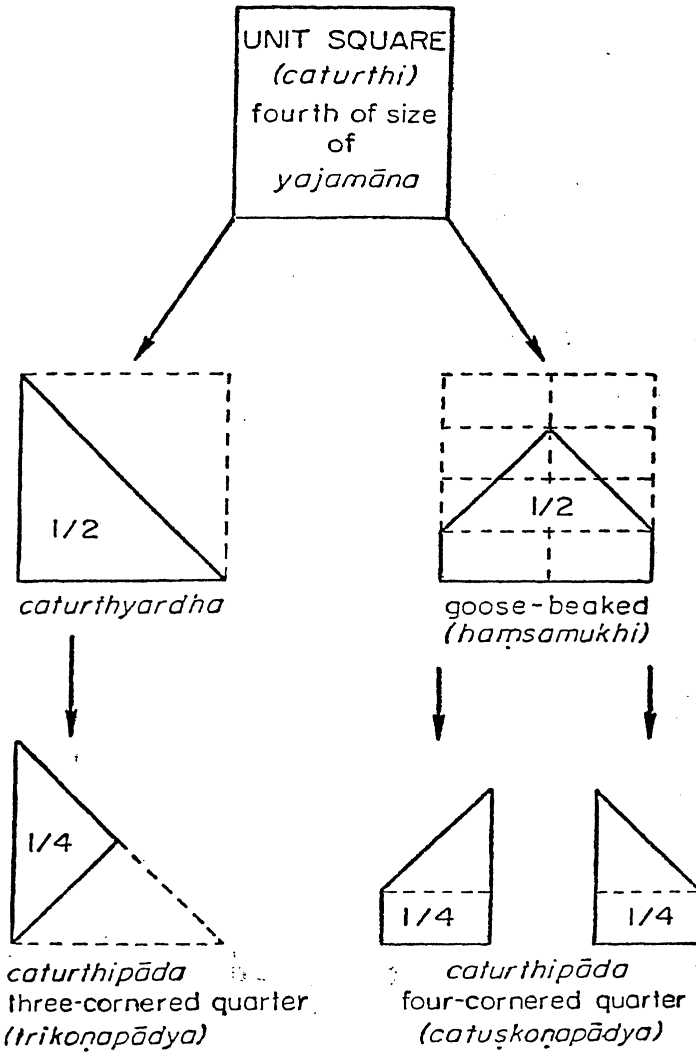

Figure 19 – The Six Shapes and Sizes of the Bricks of the Five-Tipped Bird Altar

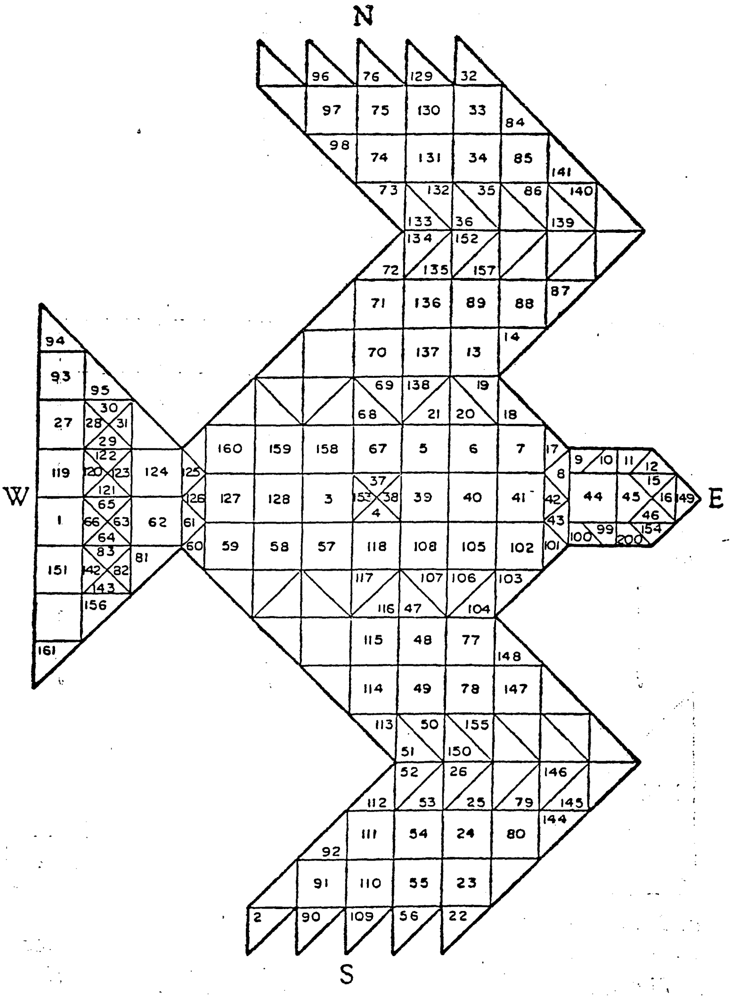

Figure 20 – The First Layer of the Five-Tipped Bird Altar

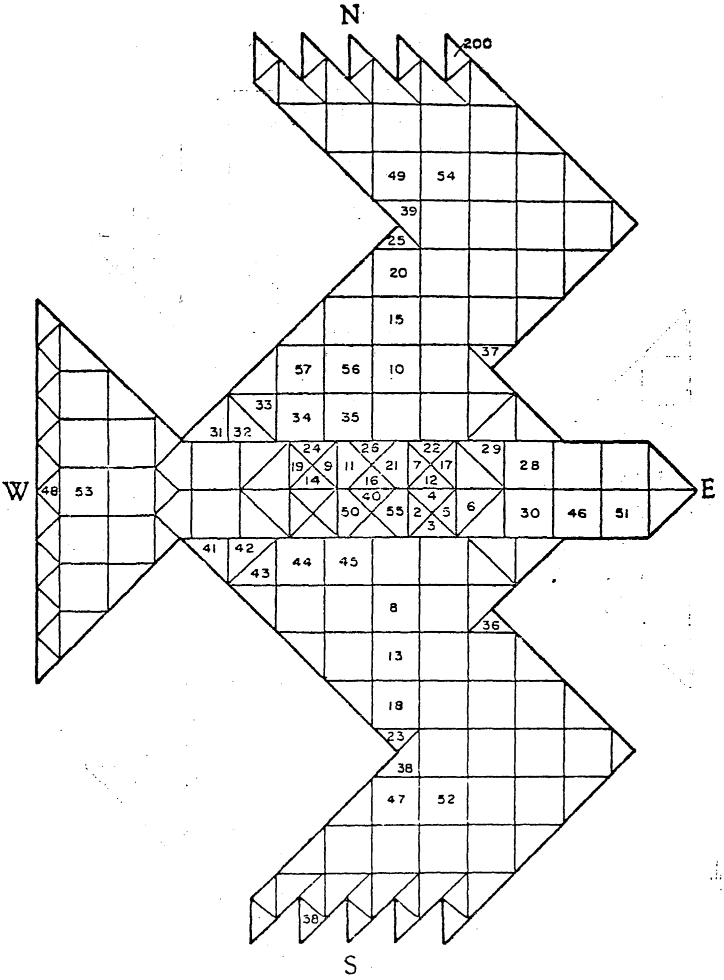

Figure 21 – The Second Layer of the Five-Tipped Bird Altar

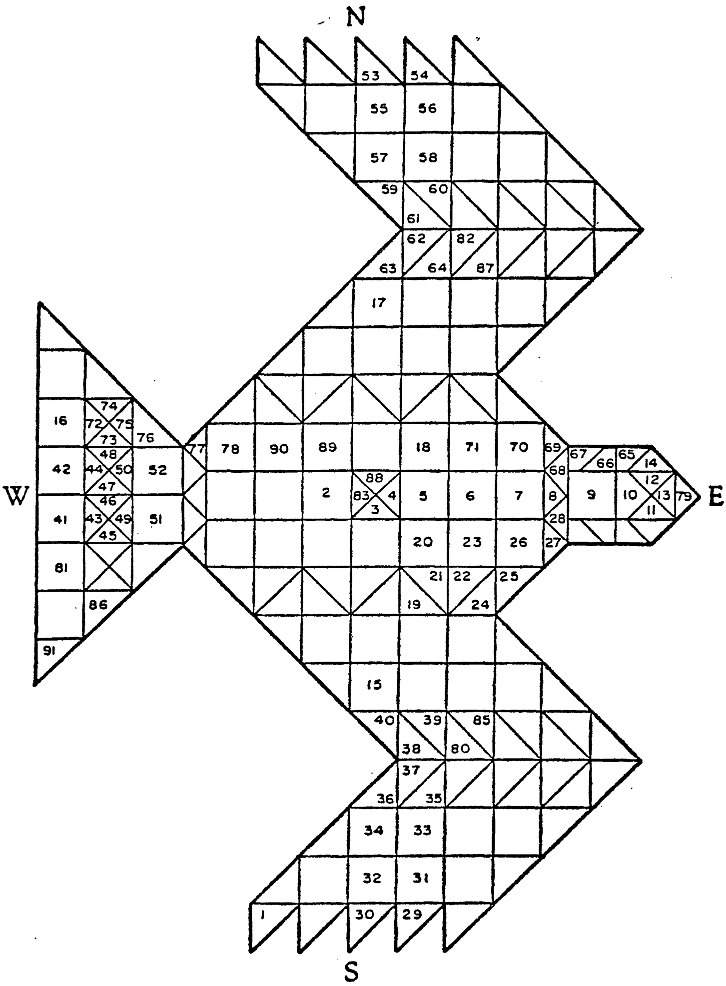

Figure 22 – The Third Layer of the Five-Tipped Bird Altar

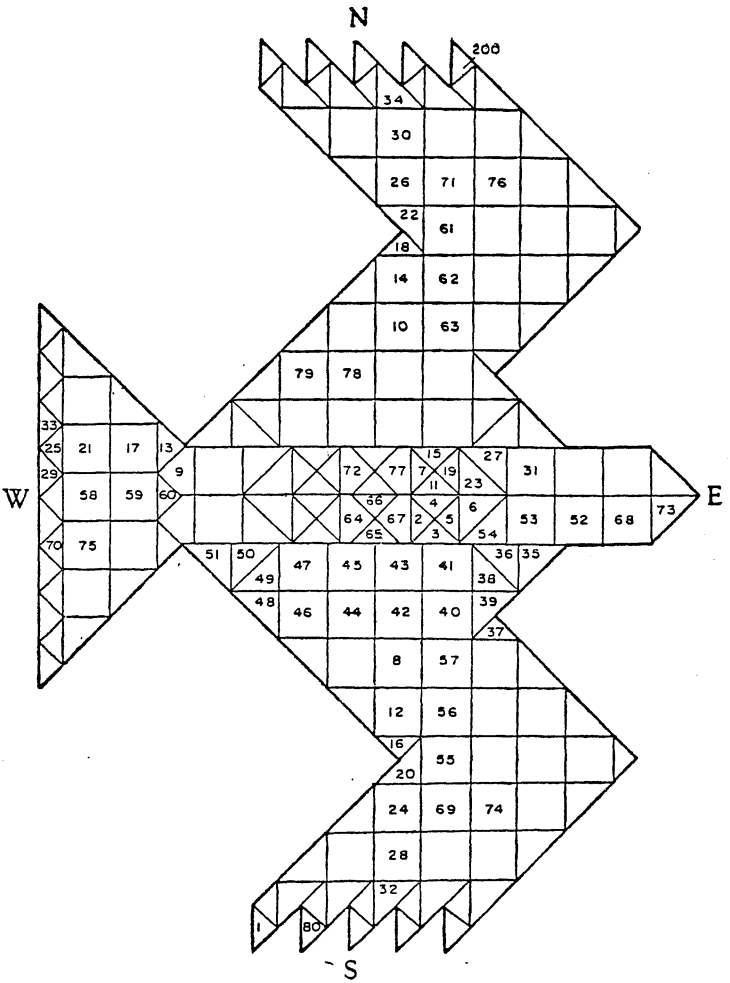

Figure 23 – The Fourth Layer of the Five-Tipped Bird Altar

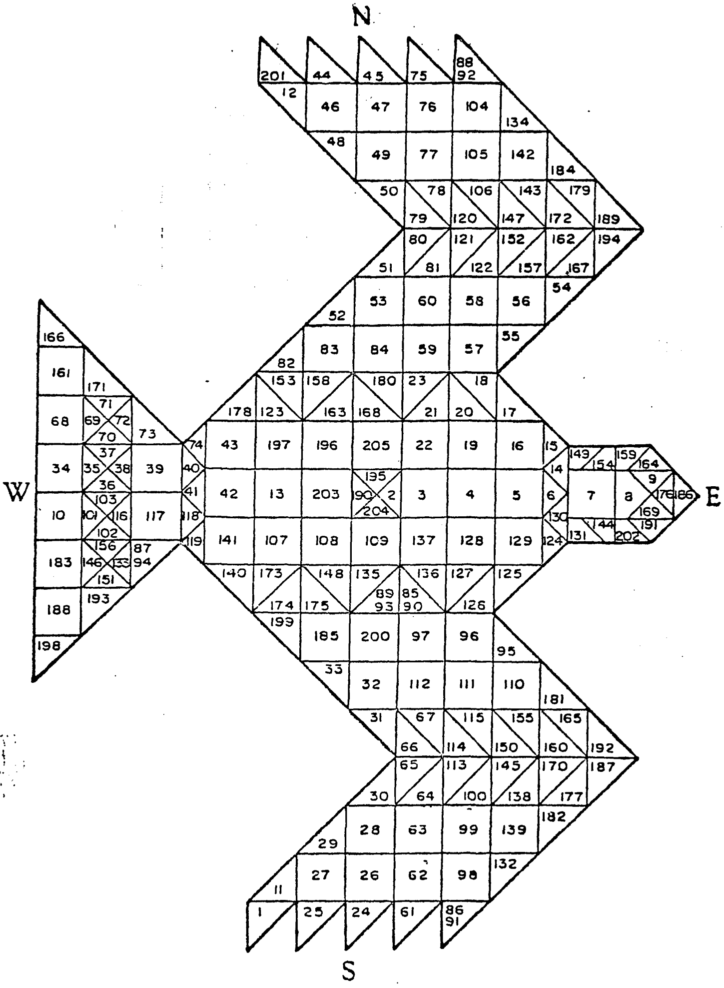

Figure 24 – The Fifth Layer of the Five-Tipped Bird Altar

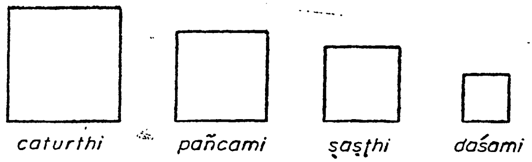

Figure 25 – The Four Sizes of the Bricks of the Square Bird Altar

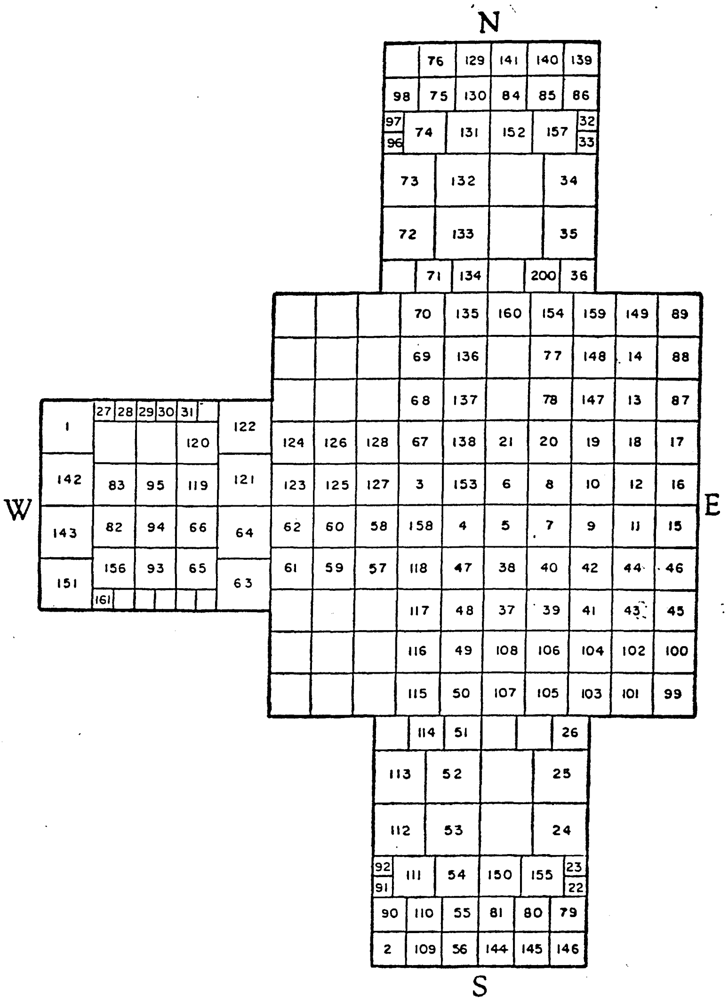

Figure 26 – The First Layer of the Square Bird Altar

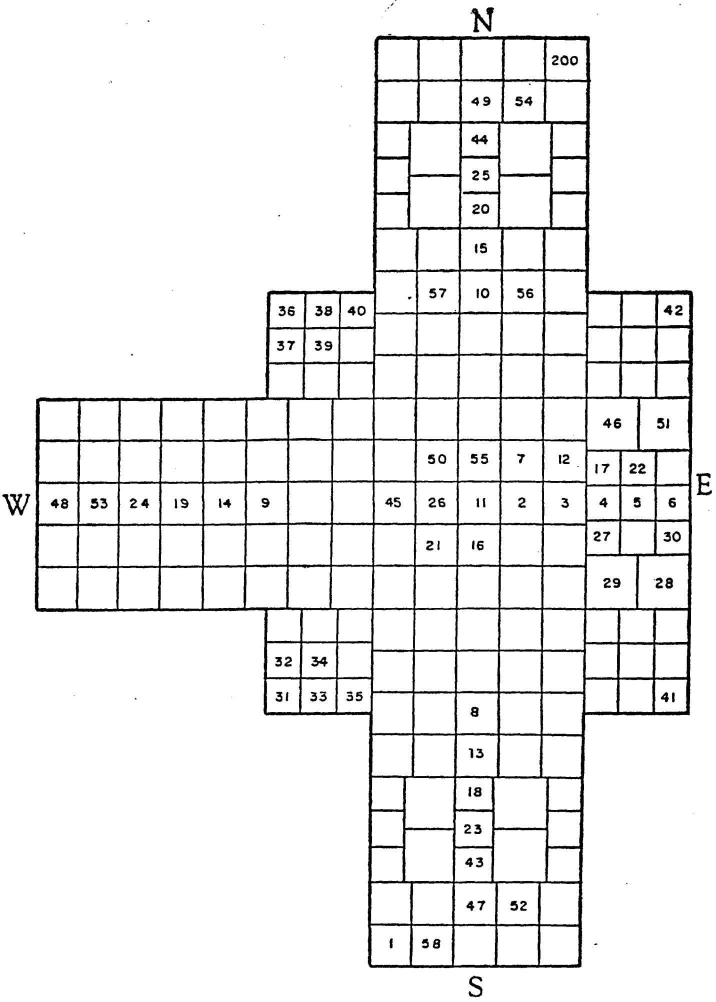

Figure 27 – The Second Layer of the Square Bird Altar

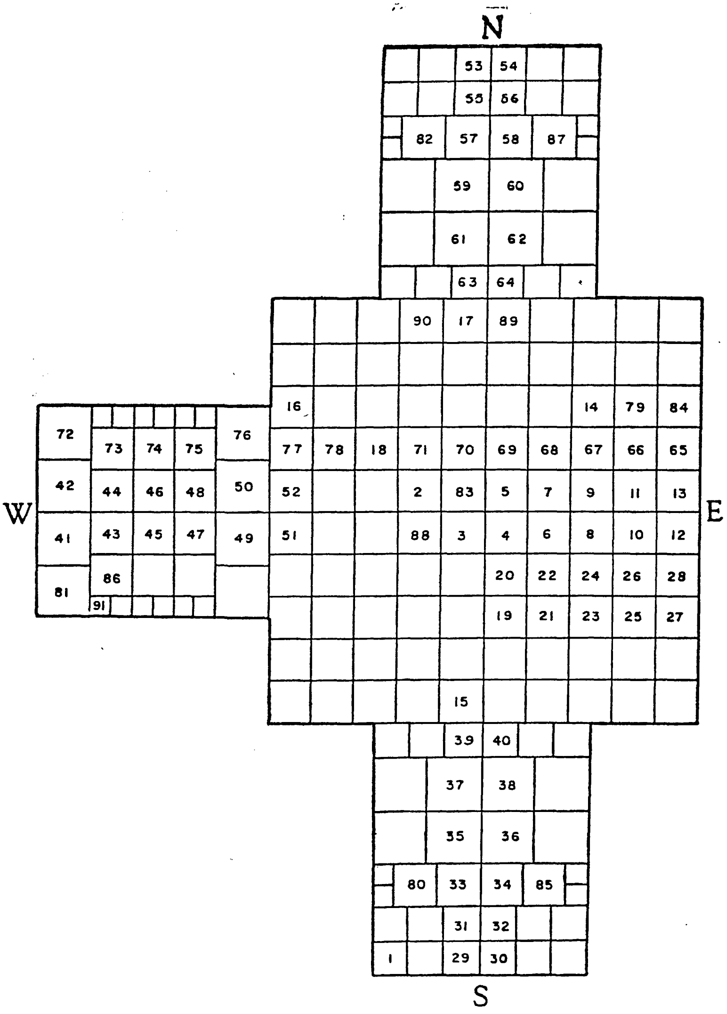

Figure 28 – The Third Layer of the Square Bird Altar

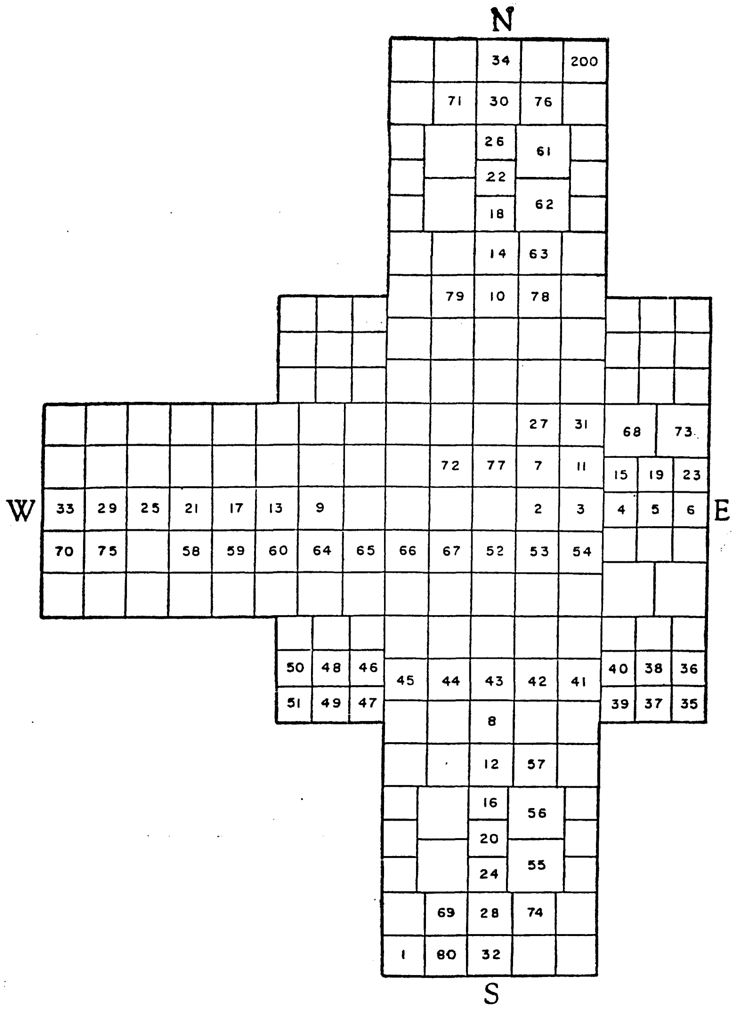

Figure 29 – The Fourth Layer of the Square Bird Altar

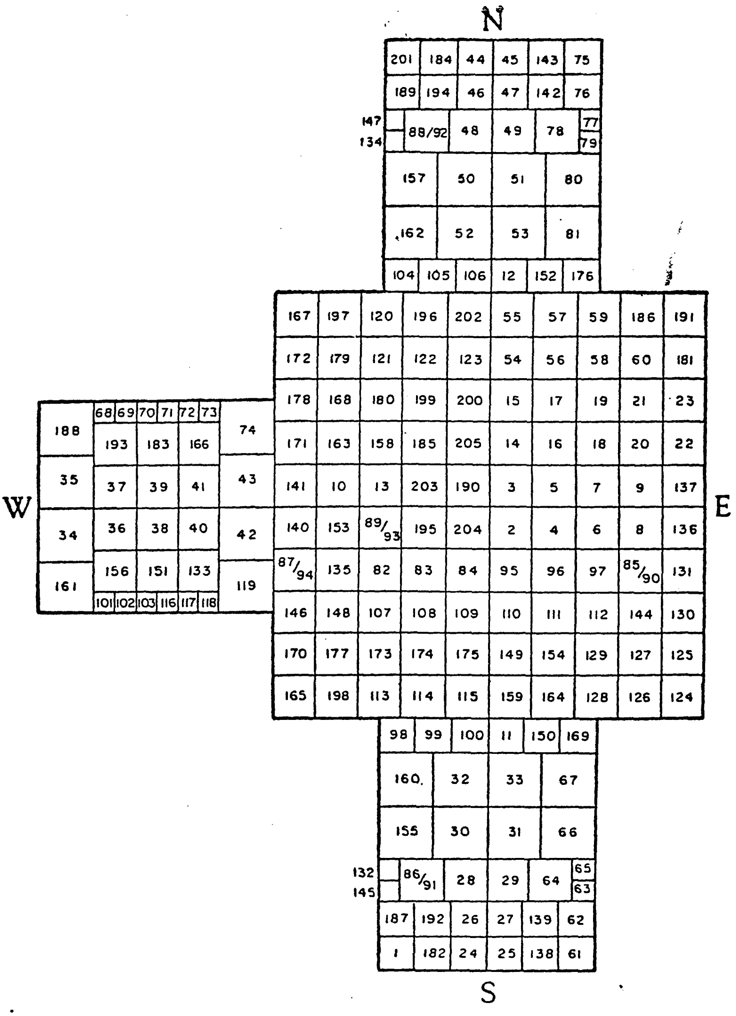

Figure 30 – The Fifth Layer of the Square Bird Altar

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